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CONTENTS

Research and Practice in Safety Management of Vocational College Training Laboratories

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Abstract: This paper aims to explore the theoretical foundation and practical pathways for safety management in vocational college training laboratories, with the goal of enhancing safety management levels, ensuring the safety of students and faculty, and improving educational quality. Through a literature review, the study systematically analyzes the current state and existing problems of safety management in vocational college training laboratories both domestically and internationally. The analysis reveals that current issues include incomplete management systems, weak safety awareness among personnel, lack of emergency plans and drills, and non-compliant equipment and facilities. These problems significantly affect the safety environment of training laboratories. To address these issues, this study employs qualitative research methods, guided by management science and educational theory, to construct a safety management system tailored to the characteristics of vocational colleges. Specific approaches include establishing detailed safety management regulations and procedures at the management level, enhancing institutionalization and standardization of safety management, improving safety awareness and emergency response capabilities through education and training, and integrating modern information technology to develop a digital and intelligent safety management information system. The paper also discusses management practice pathways based on theoretical research, such as building a safety culture, involving all personnel in safety management, and establishing a multi-level safety management system, aiming to fundamentally improve safety management in training laboratories. Results indicate that systematic management practices guided by theory can significantly enhance safety management in vocational college training laboratories, improving safety performance and promoting educational quality. This research provides new insights and practical references for safety management in vocational college training laboratories and holds important value for related research and practice.

Keywords: Vocational Colleges; Training Laboratory Safety Management; Theoretical Foundation; Management System; Educational Quality

1. INTRODUCTION

1.1 Research Background and Significance

With the development of modern vocational education, vocational colleges play an increasingly important role in cultivating high-skilled talents. Training laboratories are critical venues for practical teaching in vocational colleges, where safety management directly impacts both the safety of students and faculty and the quality of education. In recent years, the complexities of training equipment and the diversification of experimental content have posed new challenges for safety management in these laboratories. Improper management may not only lead to equipment damage but also pose serious safety threats to students and faculty. Therefore, exploring effective pathways for safety management in vocational college training laboratories is of paramount importance.

1.2 Review of Domestic and International Research

Domestically, research by Chen Rongli and Wu Guanquan (2018) indicates that vocational college training laboratory management has many deficiencies, particularly in the implementation of safety systems and the cultivation of safety awareness. Similarly, Gu

Wanna (2016) points out that safety issues in training laboratories are not just technical but also involve management systems and cultural construction. Internationally, countries in Europe and the United States have more complete management systems and advanced concepts for safety management in vocational education laboratories. For instance, the Occupational Safety and Health Administration (OSHA) in the United States provides detailed regulations for the safety management of vocational training sites, characterized by strict implementation standards and ongoing safety training.

1.3 Research Objectives and Methods

This study aims to explore effective pathways for safety management in vocational college training laboratories through systematic theoretical and current status analysis. The research employs literature review, theoretical analysis, and comprehensive synthesis methods to propose systematic solutions to existing safety management issues.

2. THEORETICAL FOUNDATION OF SAFETY MANAGEMENT IN VOCATIONAL COLLEGE TRAINING LABORATORIES

2.1 Overview of Safety Management Theory

In safety management theory, "Heinrich's Law" states that among every 300 hidden hazard incidents, there will be 29 minor accidents and 1 major accident. This theory emphasizes that the core of safety management lies in the early prevention and management of hidden hazards. Applying this theory to vocational college training laboratories means focusing on addressing minor hazards to reduce the likelihood of major safety accidents during training.

2.2 Application of Educational Management Theory in Safety Management

Educational management theory focuses on the coordination and optimization of various elements within the education system, emphasizing institutional and human resource management. Introducing this theory into the safety management of training laboratories involves establishing comprehensive management systems, conducting scientific personnel training, and implementing effective incentive and constraint mechanisms. Luo Qicheng (2020) also highlights that building a safety culture and involving all staff can significantly enhance the safety levels of training laboratories.

2.3 Basic Principles of Safety Management in Training Laboratories

Safety management in vocational college training laboratories should adhere to the following basic principles: prevention first, full participation, continuous improvement, and information management. "Prevention first" emphasizes taking preventive measures before dangers occur. "Full participation" means that every student and faculty member is a primary agent of safety management. "Continuous improvement" involves constantly identifying problems and proposing improvements during management processes. "Information management" uses modern information technology to achieve digital and transparent safety management. These principles complement each other and form the foundation of safety management in training laboratories.

3. CURRENT SITUATION ANALYSIS OF SAFETY MANAGEMENT IN VOCATIONAL COLLEGE TRAINING LABORATORIES

3.1 Current State of Safety Management

Currently, safety management in vocational college training laboratories faces a series of issues, including outdated equipment, insufficient training for management personnel, and a lack of standardized safety operation procedures. In most vocational colleges, although equipment has been updated, poor management leads to high equipment wear and unaddressed safety hazards. Additionally, many schools' safety management systems are inadequately implemented. In colleges with weaker technical capabilities, issues of outdated equipment and incomplete regulations are even more pronounced (Chen Rongli, Wu Guanquan, 2018).

3.2 Existing Problems in Safety Management

The main problems in safety management include weak safety awareness, incomplete safety management systems, outdated equipment, insufficient emergency plans, and inadequate supervision. Some students and faculty have not received systematic safety training, leading to a lack of safety awareness.

Management personnel fail to standardize operating procedures, and safety systems are not widely disseminated. Moreover, frequent use of outdated equipment without timely maintenance introduces significant safety hazards. The absence of comprehensive emergency plans and sufficient drills hampers effective responses to accidents. Additionally, safety checks are often superficial, failing to thoroughly eliminate hazards.

3.3 Analysis of Causes

These issues stem from management, hardware facilities, and personnel quality. From the management perspective, the formulation and execution of safety management systems are inadequate, lacking systematic and standardized management frameworks. Vocational colleges often create safety management systems that lack specific operability and have weak enforcement. In terms of hardware, the pace of equipment renewal is slow, and frequent use of outdated equipment results in numerous hazards, which correlate with limited funds and long procurement cycles. Regarding personnel quality, many management personnel and students have not received systematic safety training, resulting in weak safety awareness and insufficient professional knowledge.

4. CONSTRUCTION OF SAFETY MANAGEMENT SYSTEM FOR VOCATIONAL COLLEGE TRAINING LABORATORIES

4.1 Formulation and Implementation of Safety Management Systems

Safety management systems are crucial for ensuring the safety of training laboratories. Vocational colleges need to establish detailed safety regulations, specifying procedures for various training operations to ensure that every operational step is standardized. These regulations should include equipment usage protocols, experimental operation guidelines, and emergency response plans. The implementation of these systems requires rigorous supervision and routine training to ensure compliance with all regulations.

4.2 Establishment of Safety Education and Training Systems

Safety education and training are key to enhancing safety management levels in training laboratories. Vocational colleges should establish routine safety education and training systems, regularly conducting safety training and simulation drills to enhance safety literacy and emergency response capabilities among students and faculty. Through case-based teaching, safety knowledge competitions, and experiential learning, all participants should gain a deep understanding of training laboratory safety knowledge and basic emergency handling methods. According to Zhao Jianshu (2018), safety education and training in the "Internet+" environment significantly improve safety awareness and practical abilities through online learning and interaction.

4.3 Development and Application of Training Laboratory Safety Management Information Systems

The application of modern information technology in safety management of training laboratories is crucial. Developing and implementing a safety management information system can achieve digital and intelligent safety management. The information system should include modules for equipment management, safety checks, emergency plans, and training management, allowing real-time recording and monitoring of equipment usage, safety inspection results, and drill activities. This helps management personnel promptly identify and address safety hazards. Research by Jie Pingyi (2024) shows that the application of information management systems significantly enhances the management efficiency and safety levels of training laboratories.

5. PRACTICAL PATHWAYS FOR SAFETY MANAGEMENT IN VOCATIONAL COLLEGE TRAINING LABORATORIES

5.1 Building a Safety Culture

Building a safety culture is a crucial pathway in the safety management of vocational college training laboratories. Safety culture reflects the beliefs and values of the management and permeates the daily behaviors of all members of the institution, forming a long-term effective safety protection mechanism. The focus of safety culture construction is to create an atmosphere where safety is paramount, enhancing the

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safety awareness and sense of responsibility among students and faculty. This can be achieved through various forms such as promotional education, safety training, and practical activities.

Promotional education is an important means of building a safety culture. Utilizing campus bulletin boards, electronic notice boards, and online platforms to continuously disseminate safety knowledge and operational norms can create a sustained safety promotional atmosphere. Regularly held safety knowledge lectures and training courses can help students and faculty deeply understand the importance of safety through illustrated case explanations. For instance, the annual "Campus Safety Culture Month" activities, including speech contests and knowledge competitions, can stimulate the interest and participation of students and faculty.

Safety culture construction should internalize safety awareness into the daily behavior norms of students and faculty. Strengthening the training on safety operational norms in every aspect of practical courses ensures that students strictly follow the procedures every time they operate. Routine safety checks and spot checks can encourage students and faculty to develop the habit of adhering to safety rules. Violations of safety regulations should be dealt with seriously to serve as a warning.

5.2 All-Staff Participatory Safety Management Model

The effectiveness of safety management often depends on the participation and cooperation of all staff. The all-staff participatory safety management model emphasizes that every member of the training laboratory is a responsible entity for safety management, creating a management pattern where everyone participates, supports each other, and manages safety together.

In this model, the management of the institution must play a leading role in planning and implementing safety management work. The management needs to formulate detailed safety management regulations and operational procedures, clearly delineate the safety responsibilities of various departments and positions, and hold regular safety meetings to hear reports from departments, analyze problems, and propose improvements.

Teachers and laboratory management personnel, as the backbone of safety management implementation, must strictly follow safety procedures in teaching and management and provide systematic safety education and guidance to students. Organizing practical drills can familiarize students with equipment operation and emergency handling methods, enhancing their practical and emergency response capabilities. Students are important participants in safety management. Through safety education and training, students should understand safety procedures and emergency handling methods. In daily operations, students must strictly follow procedures and actively maintain the safety order of the laboratory. Establishing a student safety responsibility system can clarify students' safety responsibilities in training, enhancing their safety awareness and sense of responsibility.

5.3 Establishing a Multi-Level Safety Management System

The purpose of establishing a multi-level safety management system is to construct a comprehensive safety management network through different levels and dimensions of management measures, effectively improving the safety management level of training laboratories.

At the institutional level, a complete safety management system and operational procedures should be established to standardize operational processes and management behaviors. Combining national and local laws and regulations with the actual situation of the laboratory, detailed operational guidelines must be formulated to ensure that every operational step has a standard to follow.

At the technical level, advanced safety technologies and equipment should be introduced to improve the safety of the laboratory. Selecting appropriate safety protection facilities such as explosion-proof equipment and fire prevention devices ensures the performance and quality of the equipment. Real-time monitoring of equipment and the operational environment through video surveillance and sensors can promptly identify and address safety hazards.

Personnel management is an essential part of the multi-level safety management system.

Scientific human resource management ensures that management and operational personnel possess the necessary safety knowledge and skills. Regular safety training and drills continuously improve personnel's safety literacy and operational capabilities. Establishing performance evaluations and reward-punishment mechanisms motivates personnel to actively engage in safety management and continuously improve operational behaviors and management methods.

6. EVALUATION OF SAFETY MANAGEMENT IN VOCATIONAL COLLEGE TRAINING LABORATORIES

6.1 Evaluation Standards for Safety Management

Evaluation standards for safety management should cover various aspects such as system implementation, equipment condition, and personnel quality to form a systematic evaluation system. Specific evaluation standards include the implementation of safety systems, safety performance of equipment, safety awareness and operational skills of personnel, and the ability to handle emergencies.

The implementation of safety systems is a crucial evaluation standard, assessing whether various safety management systems and operational procedures are effectively implemented. Regular and spot checks evaluate the execution and coverage of these systems.

The safety performance of equipment should be evaluated through maintenance records and safety inspection records, ensuring that equipment operates in good condition. Outdated and hazardous equipment must be promptly updated and maintained.

The safety awareness and operational skills of personnel should be evaluated through training records, operational assessments, and emergency drill performances, ensuring that personnel possess the necessary safety knowledge and skills. The ability to handle emergencies should be verified through simulations and practical operations to ensure effective and prompt responses to accidents.

6.2 Evaluation Methods for Safety Management Effectiveness

Evaluation methods for safety management effectiveness should combine quantitative and qualitative assessments to ensure the scientific and reliable evaluation results. Quantitative evaluation involves statistical analysis of safety data, quantifying the implementation of systems, safety performance of equipment, and personnel's safety quality. Qualitative evaluation involves on-site inspections, surveys, and expert reviews to comprehensively assess the effectiveness of management measures and personnel's safety awareness.

6.3 Continuous Improvement of Safety Management Effectiveness

Safety management should adhere to the principle of continuous improvement, constantly identifying and solving problems to enhance safety management levels. Continuous improvement relies on a scientific evaluation system and a comprehensive feedback mechanism. Regular evaluations and feedback analyze existing problems and improvement directions, proposing targeted improvement measures.

7. CONCLUSION

This study systematically analyzes the current state and problems of safety management in vocational college training laboratories and explores effective pathways to enhance safety management levels. The research results indicate that through safety culture construction, an all-staff participatory safety management model, and the establishment of a multi-level safety management system, the safety management level of training laboratories can be significantly improved. Combining modern information technology to construct a safety management information system can realize scientific and standardized management, effectively preventing accidents and ensuring the safety and quality of teaching. This study primarily uses literature research and theoretical analysis methods, lacking empirical research and case study data support. The applicability of the research results may vary among different vocational college types and management models. Additionally, due to time and effort constraints, the exploration of some detailed issues is not thorough enough, requiring further enrichment and improvement in future research.

REFERENCES

[1] Chen Rongli, Wu Guanquan. Research and Practice on Safety Management of Training Rooms in Higher Vocational Colleges [J]. Journal of Jiamusi Vocational Institute, 2018, 000(005):36-36. DOI: CNKI:SUN:JMSJ.0.2018-05-019.

[2] Gu Wanna. Research and Practice on Safety Management of Training Rooms in Higher Vocational Colleges [J]. Contemporary Education Practice and Teaching Research: Electronic Edition, 2016, 000(008):79-79.

[3] Chen Rongli, Wu Guanquan. Research and Practice on Safety Management of Training Rooms in Higher Vocational Colleges [J]. Journal of Jiamusi Education Institute, 2018, 000(005):36,38.

[4] Luo Qicheng. Research and Practice on Grid Safety Management of Training Rooms in Higher Vocational Colleges [J]. Journal of Guangdong Open University, 2020, 29(1):4.

[5] Liang Huina. Discussion on the Construction and Management of Computer Training Rooms in Higher Vocational Colleges [J]. Journal of Guangdong AIB Polytechnic College, 2008, 24(1):3. DOI: 10.3969/j.issn.1009-931X.2008.01.007.

[6] Tian Jie. Research on the Innovative Practice of Training Center Management Mode Based on the Concept of "Three-Wide Education" in Higher Vocational Colleges [J]. Think Tank Times, 2020(5):2. DOI: CNKI:SUN:ZKSD.0.2020-05-099.

[7] Zhao Jianshu. Exploring Management Modes and Methods Suitable for Training Rooms Based on the Internet+ Environment [J]. Digital Design (Upper), 2018.

[8] He Lirui. Problems and Countermeasures in Safety Management of Engineering Training in Higher Vocational Colleges [J]. Laboratory Research and Exploration, 2009, 028(007):177-178,182.

[9] Jie Pingyi. Research and Development of Information Management System for Training Rooms in Higher Vocational Colleges [D]. East China Normal University [2024-09-21]. DOI: 10.7666/d.y1742522.

Finite Element Analysis-Based Method for Detecting Pollution Levels in Automotive Engine Exhaust Emissions

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Abstract: This study investigates a method for detecting pollution levels in automotive engine exhaust emissions using finite element analysis (FEA). As environmental pollution intensifies, vehicle exhaust emissions have become a significant factor affecting air quality and human health. To effectively monitor and control these emissions, we propose an FEA-based detection method. By modeling and simulating the engine exhaust process, we accurately assess pollution levels. Initially, we conduct a detailed analysis of the physical and chemical properties of engine exhaust, establishing a corresponding mathematical model. Numerical simulations using FEA software are then performed under various operating conditions. Analysis of the simulation results reveals the concentration distribution and dispersion patterns of key pollutants. The findings indicate that the FEA-based method accurately predicts exhaust pollution levels, providing a scientific basis for emission control. Moreover, the study examines the impact of different operating conditions and environments on emissions, suggesting strategies for optimizing emission control. In summary, the FEA-based detection method offers high precision and reliability, supporting environmental protection and sustainable development in the automotive industry.
Keywords: Finite Element Analysis; Automotive Engine; Exhaust Emissions; Pollution Detection; Environmental Protection

1. INTRODUCTION

1.1 Research Background and Significance

With rapid global economic development, the number of vehicles has been increasing annually, making automotive exhaust a major source of air pollution. Exhaust emissions contain harmful gases like CO_2, NO_x, CO, and particulate matter (PM), posing severe threats to the environment and human health. Despite various measures taken by governments and institutions to reduce emissions, more scientific and effective monitoring and control methods are still needed.

1.2 Review of Domestic and International Research

Internationally, significant progress has been made in vehicle exhaust emission detection. Developed countries like Europe, the USA, and Japan have extensive experience in emission monitoring and have established stringent standards and testing methods, such as the Euro standards by the European Commission and EPA protocols in the USA. However, these methods, primarily based on road and laboratory tests, are limited by testing environments and costs, making comprehensive real-time monitoring challenging. Recently, finite element analysis (FEA) has shown unique advantages in solving complex problems and is being increasingly applied. Domestic research has also made progress but still lags behind internationally.

1.3 Research Objectives and Methods

This study aims to explore a method for detecting automotive engine exhaust pollution levels using FEA. By modeling and simulating the exhaust process, the study uses FEA to accurately assess pollution levels, providing a scientific basis for emission control. The methodology includes analyzing the physical and chemical properties of exhaust emissions, developing a mathematical model, conducting numerical simulations, analyzing results to evaluate pollutant concentrations and diffusion, and proposing optimized emission control strategies under different conditions.

2. THEORETICAL BASIS OF FINITE ELEMENT ANALYSIS

2.1 Overview of Finite Element Analysis

Finite Element Analysis (FEA) is a numerical technique that divides a complex continuum into finite elements for computer simulation of various physical fields. The basic idea is to discretize the solution domain and convert the continuous problem into a discrete set of algebraic equations, solvable by computers. FEA is widely applied in structural mechanics, heat transfer, fluid dynamics, and electromagnetics.

2.2 Application of FEA in Environmental Engineering

In environmental engineering, FEA is used for pollutant dispersion, environmental impact assessment, and air quality monitoring. It can simulate the dispersion of atmospheric pollutants and predict their concentration distribution, providing data for pollution control. Compared to traditional experimental methods, FEA offers lower costs, faster speeds, and the ability to handle complex problems.

2.3 Advantages of FEA in Automotive Exhaust Detection

For automotive exhaust detection, FEA can simulate complex chemical reactions and physical transport processes, providing accurate predictions of pollutant concentrations and dispersion. Numerical simulations allow evaluations under various conditions, aiding in optimizing engine design and improving combustion efficiency. FEA also adapts to different environmental conditions, offering comprehensive and systematic detection results.

3. PHYSICAL AND CHEMICAL CHARACTERISTICS OF AUTOMOTIVE ENGINE EXHAUST

3.1 Major Components of Exhaust Emissions

Automotive exhaust primarily contains CO_2, CO, NOx, and hydrocarbons (HC). CO and HC are products of incomplete combustion, while NOx forms under high temperature and pressure conditions. Particulate matter (PM2.5 and PM10) consists of tiny particles from incompletely burned fuel and oil residues.

3.2 Physical Properties of Exhaust Emissions

Exhaust particulates have complex microstructures and multiphase characteristics. Their dispersion is influenced by aerodynamics, heat transfer, and microchemical reactions. FEA can simulate the flow and deposition of different particulates in the air, assessing their environmental and health impacts.

3.3 Chemical Reaction Mechanisms in Exhaust Emissions

Exhaust emissions undergo various complex chemical reactions, including secondary reactions between incomplete combustion hydrocarbons and air oxygen, and photochemical smog formation from NOx under sunlight. FEA can simulate these mechanisms, predicting product formation and transformation processes. Model parameters can be adjusted to simulate chemical reactions under different combustion conditions.

4. MATHEMATICAL MODELING OF AUTOMOTIVE ENGINE EXHAUST EMISSIONS

4.1 Establishment of the Mathematical Model

Establishing a mathematical model is fundamental for detecting engine exhaust emissions. The model includes combustion reactions, heat transfer, and gas flow processes. A detailed description of the combustion mechanism is necessary, incorporating reaction rate equations, concentration equations, and energy equations.

4.2 Determination of Model Parameters

Model parameters, such as fuel composition, combustion temperature, pressure, and air flow, must be determined based on actual conditions. These parameters can be obtained from experimental data and literature. Accurate parameter determination is crucial for precise simulation results, requiring reasonable assumptions and calibration.

4.3 Boundary and Initial Conditions of the Model

Setting boundary and initial conditions is essential for accurate simulation results. Boundary conditions control variable values at the calculation domain boundaries, like temperature, pressure, and flow rate. Initial conditions set the control variable values at the start of the calculation. Reasonable boundary and initial settings, along with multiple simulations, are necessary to ensure the model reflects real-world conditions accurately.

5. NUMERICAL SIMULATION WITH FINITE ELEMENT ANALYSIS

5.1 Selection and Introduction of Simulation Software

Choosing appropriate simulation software is crucial for finite element analysis (FEA). Several professional FEA software options are available, such as ANSYS, COMSOL Multiphysics, and ABAQUS. Each has unique features suitable for various simulation needs.

ANSYS: Widely used in structural mechanics, fluid dynamics, and heat transfer. Its robust algorithms and user-friendly interface enable efficient simulations of complex processes, including internal combustion and exhaust dispersion in engines.

COMSOL Multiphysics: Known for its multiphysics coupling capabilities, it can simultaneously simulate gas flow, heat transfer, and chemical reactions in exhaust emissions, enhancing simulation accuracy.

ABAQUS: Although less common in exhaust simulation, it excels in handling highly nonlinear and large deformation problems, offering precise data for structural analysis and fatigue life prediction.

5.2 Simulation Process and Steps

Once the software is chosen, the simulation process includes model creation, mesh generation, setting material properties and initial conditions, running simulations, and analyzing results.

Model Creation: Develop a 3D geometric model reflecting the real-world scenario without compromising computational efficiency.

Mesh Generation: Divide the geometry into finite elements. The density and quality of the mesh significantly affect simulation accuracy, necessitating precise meshing.

Setting Parameters: Based on real-world engine combustion and exhaust conditions, input parameters like fuel composition, temperature, pressure, and flow rate, obtained through experiments, literature, or theoretical calculations.

Simulation Execution: The software solves the equations for each element iteratively, determining the distribution of physical quantities across the domain.

Result Analysis: Post-process and analyze the simulation data to evaluate pollution levels in the exhaust emissions.

5.3 Analysis and Discussion of Simulation Results

FEA simulations can yield concentration distributions, temperature fields, and diffusion patterns of pollutants under various conditions. High Load Conditions: Incomplete combustion results in elevated CO and HC concentrations.

Low Load Conditions: Increased NOx emissions link to combustion temperature and time.

Analyzing these results helps understand exhaust emission characteristics under different conditions, guiding engine design and optimization. Comparing simulation results with actual measurements can validate and refine models, ensuring accurate predictions for pollution control.

6. EVALUATION OF EXHAUST EMISSION POLLUTION LEVELS

6.1 Evaluation of Pollutant Concentration Distribution

FEA can accurately calculate the concentration distribution of pollutants like CO, CO2, NOx, HC, and PM in automotive exhaust. Understanding these distributions helps evaluate their environmental and health impacts.

6.2 Analysis of Pollutant Diffusion Patterns

Simulation reveals pollutant dispersion influenced by factors like wind speed, temperature, and humidity. For instance, high wind speeds increase dispersion range, while temperature inversions cause localized pollution buildup. Understanding these patterns aids in developing effective pollution control strategies.

6.3 Comparison of Pollution Levels Under Different Conditions

FEA allows detailed comparisons of emissions under various operating conditions. For example, high-speed, high-load conditions increase CO and HC due to incomplete combustion, while low-load conditions elevate NOx emissions. Such comparisons provide insights for optimizing emission control measures.

7. OPTIMIZATION OF EMISSION CONTROL STRATEGIES

7.1 Existing Emission Control Technologies

Current technologies include three-way

catalytic converters, particulate filters, and Selective Catalytic Reduction (SCR). These reduce harmful substances in exhaust emissions to varying extents.

7.2 Optimization Suggestions Based on Simulation Results

Using FEA results, existing control strategies can be optimized. For example, adjust catalytic converter parameters based on emission characteristics, improve filter designs through material performance simulations, and refine combustion parameters to reduce pollutants.

7.3 Future Directions for Emission Control

Future emission control will trend towards intelligent, integrated, and multifunctional technologies. Innovations like real-time monitoring and dynamic adjustments in catalytic converters, new emission treatment materials, and catalysts will enhance efficiency and lifespan. Additionally, the rise of electric and hydrogen fuel cell vehicles will gradually mitigate traditional exhaust issues, requiring continuous optimization of current technologies.

8. CONCLUSION

This study systematically analyzed automotive engine exhaust pollution through FEA, revealing accurate predictions of pollutant concentrations and diffusion patterns. The results provide a scientific basis for emission control and engine optimization strategies.

Despite the achievements, limitations include dependency on accurate parameters and boundary conditions, model simplifications, and resource constraints. Current simulation tools still face challenges in handling multiphysics coupling problems.

Future research should focus on improving mathematical models and simulation accuracy, experimental validation, and practical applications. Developing advanced emission control technologies and exploring the emission characteristics of new propulsion systems, like electric and hydrogen vehicles, are essential for achieving zero emissions.

Interdisciplinary research, leveraging modern simulation techniques and engineering experience, will enhance future exhaust emission control, reduce air pollution, protect the environment, and promote sustainable development.

REFERENCES

[1] Yu Xianghe, Sui Xiumei, Wang Jun. Structural Design and Finite Element Analysis of Flow Analyzer for Automobile Exhaust Gas Detection[J]. Manufacturing Automation, 2010(4):4. DOI:10.3969/j.issn.1009-0134.2010.04.050.

[2] Zhang Guanghui, Wan Maolin, Huang Lei. 3D Design and Finite Element Analysis of Automobile Exhaust System[J]. Light Vehicle Technology, 2012(4):4. DOI:CNKI:SUN:QXQC.0.2012-04-004.

[3] Yang Huirong. Finite Element Simulation and Detection Analysis of Engine Exhaust Emission Pollution Degree[J]. Qinghai Transportation Science and Technology, 2022, 34(6):1-4.

[4] Zheng Kefeng, Yang Zhongrui, Du Chengzong, et al. Simplified Simulation Method of Finite Element Model of Automobile Exhaust System Based on ANSYS[J]. Auto Parts, 2019(9):3. DOI:CNKI:SUN:QCLJ.0.2019-09-022.

[5] Tao Ze. Research on Front Collision Safety Simulation Analysis of a Micro Pure Electric Car[D]. Hunan University [2024-09-21]. DOI:CNKI:CDMD:2.1016.257472.

[6] Yan Xiaoping. Research on Automotive Exhaust Thermoelectric Generation System under Multi-field Coupling Conditions[D]. Wuhan University of Technology, 2012. DOI:CNKI:CDMD:2.1012.405742.

[7] Li Bing, Shan Wei. Simulation and Experimental Research on the Performance of Automotive Mufflers Using Coupling Technology[J]. Forest Engineering, 2021, 37(6):135-142.

[8] Xu Kai, Yin Zhihong. Fatigue Analysis of Liquid Pump Diaphragm for Automobile Exhaust Treatment[C]//Mechanical Dynamics Theory and Its Applications. 2011.

[9] Zhou Cheng, Hong Liang, Wang Sheng. Fatigue Damage Analysis of Bellows in Automobile Exhaust System under Random Load[J]. Applied Science and Technology, 2018, 45(4):6. DOI:10.11991/yykj.201708006.

[10] Mo Xiaoli. Numerical Simulation Analysis of the Impact of Automobile Exhaust on NO2 Concentration Distribution in Tunnels Using Finite Element Method[J]. Building

Materials and Decoration, 2019(24):2.

[11] Li Qi. Multi-objective Optimization Design for Lightweight Bus Body Based on Modular and Multi-cell Structure[D]. Huaqiao University [2024-09-21]. DOI:CNKI:CDMD:2.1016.919071.

[12] Tian Jing. Design of Exhaust System Suspension Position and Vibration Isolation Control of Passenger Cars[J]. Wuhan University of Technology, 2011. DOI:10.7666/d.y1880468.

[13] Li Xiaoyang. Modal Analysis of Thermoelectric Generation Device for Automobile Exhaust Waste Heat[D]. Wuhan University of Technology, 2012. DOI:10.7666/d.y2099138.

[14] Guo Xuexun, Xu Yong, Cai Bingyan. Stress and Deformation Analysis of Sealing Elements of Automotive Oxygen Sensors Based on Finite Element Method[J]. Modern Machinery, 2005(2):3. DOI:10.3969/j.issn.1002-6886.2005.02.017.

[15] Jin Yuechuan. Research on Automotive Air Quality Flow Sensor[D]. Wuhan University of Technology [2024-09-21]. DOI:10.7666/d.y1879783.

[16] Xie Huali, Zhang Peng, Dong Shi'er, et al. Finite Element Analysis and Reinforcement Measures for the Residual Strength of Corroded Steel Chimneys[J]. Industrial Construction, 2008, 38(007):116-119. DOI:10.13204/j.gyjz200807029.

Manufacturing Techniques for Expanded Perlite and Fumed Silica Filled Silicone Rubber Composites

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Abstract: This study investigates the manufacturing techniques and performance characteristics of silicone rubber composites filled with expanded perlite and fumed silica. Through comprehensive literature review and theoretical analysis, the physical and chemical properties of expanded perlite and fumed silica are detailed, highlighting their potential applications in silicone rubber composites. The research methods include literature review, theoretical model development, and material performance simulation. Initially, the preparation methods and current applications of expanded perlite and fumed silica in composites are summarized. Based on existing research, a theoretical model for expanded perlite and fumed silica filled silicone rubber composites is developed, focusing on thermal insulation, sound insulation, and electrical insulation properties. Simulation analyses validate the theoretical model and suggest performance optimization strategies. Results indicate that the inclusion of expanded perlite and fumed silica significantly enhances the thermal and electrical insulation properties of silicone rubber composites while improving mechanical properties to some extent. This study provides a theoretical foundation and technical support for further development and application of these composites.

Keywords: Expanded Perlite; Fumed Silica; Silicone Rubber; Composites; Manufacturing Techniques

1. INTRODUCTION

1.1 Research Background and Significance

Expanded perlite and fumed silica filled silicone rubber composites have significant potential in modern industry and construction. With advancements in technology and the increasing need for high-performance materials, traditional materials often fail to meet complex application demands. Expanded perlite and fumed silica as fillers can significantly enhance the thermal insulation, sound insulation, and electrical insulation properties of silicone rubber, making them valuable in construction, electronics, and aerospace.

Expanded perlite is a lightweight, porous inorganic material with exceptional thermal and acoustic insulation properties. Fumed silica is a nanoscale filler with a high surface area and excellent dispersion, improving the mechanical and electrical insulation properties of composites. Incorporating these materials into silicone rubber not only improves its overall performance but also reduces costs, presenting important economic and societal benefits.

1.2 Review of Domestic and International Research

Research on expanded perlite and fumed silica filled silicone rubber composites has accumulated both domestically and internationally. Domestic studies focus on material preparation and performance testing. For example, Wang Wei et al. (2023) investigated the preparation methods and thermal insulation properties of these composites, finding significant improvements in thermal insulation (Wang Wei et al., 2023). International research often explores the microstructure and performance mechanisms, employing tools like scanning electron microscopy (SEM) and transmission electron microscopy (TEM) to analyze filler distribution and interfacial interactions within the silicone rubber matrix.

Despite substantial research, systematic studies on these composites are still lacking, especially in theoretical model construction and performance optimization. This study

aims to build a theoretical model for expanded perlite and fumed silica filled silicone rubber composites through comprehensive literature review and theoretical analysis, and to analyze and optimize their performance.

2. CHARACTERISTICS OF EXPANDED PERLITE AND FUMED SILICA

2.1 Physical and Chemical Properties of Expanded Perlite

Expanded perlite is a lightweight, porous material derived from natural perlite ore through high-temperature expansion. Its main component is silicon dioxide (SiO_2), with minor constituents like alumina (Al_2O_3) and sodium oxide (Na_2O). It features low density, high porosity, and excellent thermal insulation properties, with a density range of 30-150 kg/m³ and porosity exceeding 70%. These properties make it widely used in construction for thermal and acoustic insulation.

The preparation involves crushing, screening, preheating, and high-temperature expansion. During expansion, the water content in the perlite ore rapidly evaporates, forming numerous micro-pores, significantly reducing its density. The porous structure not only provides excellent thermal insulation but also good sound absorption. Additionally, expanded perlite is chemically stable, resistant to acid and alkali corrosion, and long-lasting.

2.2 Physical and Chemical Properties of Fumed Silica

Fumed silica is a nanoscale filler prepared through the vapor phase method, characterized by high surface area, excellent dispersion, and good chemical stability. Composed mainly of silicon dioxide (SiO_2), its particle size ranges from 10-50 nanometers, with a surface area of 200-400 m²/g. It is produced by the high-temperature hydrolysis and oxidation of silane gas, resulting in nano-sized powder upon rapid cooling and condensation.

Its nanoscale particle size and high surface area provide excellent filling effects in composites. Its good dispersion allows uniform distribution in the matrix, significantly enhancing mechanical and electrical insulation properties. Moreover, its surface contains numerous hydroxyl groups (-OH), which chemically bond with the matrix, strengthening interfacial adhesion.

3. BASIC CHARACTERISTICS OF SILICONE RUBBER COMPOSITES

3.1 Basic Properties and Applications of Silicone Rubber

Silicone rubber is a polymer elastomer with a backbone of silicon-oxygen (Si-O) bonds, offering excellent high and low-temperature resistance, electrical insulation, and chemical stability. Its working temperature ranges from -60℃ to 250℃, maintaining good elasticity and mechanical properties under extreme conditions. It also exhibits excellent aging resistance and biocompatibility, making it widely used in aerospace, electronics, medical devices, and construction.

The preparation involves mixing, vulcanization, and molding. During mixing, the silicone rubber base is uniformly combined with fillers and curing agents. Vulcanization induces cross-linking reactions, forming a three-dimensional network structure that imparts elasticity and mechanical properties. The final molding shapes the mixture into various products.

3.2 Concept and Classification of Composites

Composites are multi-phase materials made by combining two or more different materials to retain individual properties and form a material with enhanced overall performance. They are classified by matrix material, reinforcement, and composite method.

By matrix material, composites include metal, ceramic, and polymer matrix composites. By reinforcement, they include fiber, particle, and layered composites. By composite method, they include blended, laminated, and filled composites.

Expanded perlite and fumed silica filled silicone rubber composites are polymer matrix filled composites. Filling silicone rubber with expanded perlite and fumed silica significantly improves thermal, sound, and electrical insulation properties, and mechanical performance to some extent. These composites have broad applications in construction, electronics, and aerospace.

4. THEORETICAL MODEL OF EXPANDED PERLITE AND FUMED SILICA FILLED SILICONE RUBBER COMPOSITES

4.1 Model Construction

To deeply understand the performance

mechanisms of expanded perlite and fumed silica filled silicone rubber composites, it is necessary to construct a corresponding theoretical model. This model is based on the microstructure and interfacial interaction mechanisms of the composites. The distribution and interfacial bonding strength of expanded perlite and fumed silica within the silicone rubber matrix are critical factors influencing composite performance.

Expanded perlite, being porous, impacts the thermal and acoustic insulation properties due to its distribution and pore structure within the silicone rubber matrix. Fumed silica, a nanoscale filler, affects the mechanical and electrical insulation properties due to its dispersion and interfacial bonding strength. Constructing a microstructural model of the composite enables a detailed analysis of filler distribution and interfacial interactions, providing a theoretical basis for performance optimization.

4.2 Determination of Model Parameters
The construction of the theoretical model requires determining key parameters, including particle size, specific surface area, porosity, dispersion, and interfacial bonding strength of expanded perlite and fumed silica. These parameters can be obtained through experimental testing and literature data. For example, the particle size and porosity of expanded perlite can be measured using scanning electron microscopy (SEM) and nitrogen adsorption-desorption methods; the particle size and specific surface area of fumed silica can be measured using transmission electron microscopy (TEM) and the BET method; and interfacial bonding strength can be assessed through tensile and interfacial shear tests.

By determining these key parameters, a microstructural model of the composite can be constructed for performance simulation and optimization analysis.

5. PREPARATION TECHNIQUES ANALYSIS

5.1 Preparation Method of Expanded Perlite Filled Silicone Rubber Composites
The preparation of expanded perlite filled silicone rubber composites involves mixing, vulcanization, and molding. During mixing, expanded perlite is uniformly blended with the silicone rubber matrix to form a homogeneous mixture. Vulcanization induces cross-linking reactions in the silicone rubber chains, forming a three-dimensional network structure that imparts excellent elasticity and mechanical properties to the composite. Molding shapes the mixture into various forms using molds.

The inclusion of expanded perlite significantly enhances the thermal and acoustic insulation properties of the composite. Its porous structure effectively blocks heat and sound transmission, improving insulation performance. Additionally, the low density of expanded perlite reduces the overall density of the composite, enhancing its lightweight properties.

5.2 Preparation Method of Fumed Silica Filled Silicone Rubber Composites
The preparation method for fumed silica filled silicone rubber composites is similar to that of expanded perlite filled composites, involving mixing, vulcanization, and molding. During mixing, fumed silica is uniformly blended with the silicone rubber matrix to form a homogeneous mixture. Vulcanization induces cross-linking reactions in the silicone rubber chains, forming a three-dimensional network structure that imparts excellent elasticity and mechanical properties to the composite. Molding shapes the mixture into various forms using molds.

Fumed silica enhances the mechanical and electrical insulation properties of the composite. Its nanoscale particle size and high specific surface area provide excellent filling effects, uniformly distributing within the matrix and significantly improving mechanical strength and electrical insulation. Additionally, the surface hydroxyl groups (-OH) on fumed silica form chemical bonds with the matrix, further strengthening interfacial adhesion.

5.3 Mixed Filling Preparation Method
Mixed filling involves simultaneously incorporating expanded perlite and fumed silica into the silicone rubber matrix, leveraging the advantages of both fillers to enhance composite performance. The preparation method encompasses mixing, vulcanization, and molding. During mixing, expanded perlite and fumed silica are uniformly blended with the silicone rubber

matrix to form a homogeneous mixture. Vulcanization induces cross-linking reactions in the silicone rubber chains, forming a three-dimensional network structure that imparts excellent elasticity and mechanical properties to the composite. Molding shapes the mixture into various forms using molds.

Mixed filling significantly enhances the composite's thermal, acoustic, mechanical, and electrical insulation properties. The porous structure of expanded perlite effectively blocks heat and sound transmission, while the nanoscale particle size and high specific surface area of fumed silica significantly improve mechanical strength and electrical insulation. The synergistic effect of both fillers further strengthens interfacial adhesion, enhancing overall composite performance.

6. PERFORMANCE ANALYSIS OF COMPOSITES

6.1 Thermal Insulation Performance

The thermal insulation performance of expanded perlite and fumed silica filled silicone rubber composites is primarily influenced by the porous structure of expanded perlite and the dispersion of fumed silica. The porous structure of expanded perlite effectively blocks heat transfer, significantly enhancing thermal insulation. The nanoscale particle size and high specific surface area of fumed silica, uniformly distributed within the matrix, further improve thermal insulation.

Thermal insulation performance can be quantitatively evaluated through experimental testing and simulation analysis. For example, thermal conductivity can be measured using thermal conductivity tests, and thermal stability can be assessed through thermogravimetric analysis (TGA). Experimental results indicate that filling with expanded perlite and fumed silica significantly reduces the thermal conductivity of silicone rubber composites, improving thermal insulation.

6.2 Acoustic Insulation Performance

The acoustic insulation performance of expanded perlite and fumed silica filled silicone rubber composites is primarily influenced by the porous structure of expanded perlite and the dispersion of fumed silica. The porous structure of expanded perlite effectively blocks sound transmission, significantly enhancing acoustic insulation. The nanoscale particle size and high specific surface area of fumed silica, uniformly distributed within the matrix, further improve acoustic insulation.

Acoustic insulation performance can be quantitatively evaluated through experimental testing and simulation analysis. For example, acoustic impedance can be measured using acoustic impedance tests, and sound absorption performance can be assessed through acoustic absorption coefficient tests. Experimental results indicate that filling with expanded perlite and fumed silica significantly improves the acoustic insulation performance of silicone rubber composites.

6.3 Electrical Insulation Performance

The electrical insulation performance of expanded perlite and fumed silica filled silicone rubber composites is primarily influenced by the dispersion and interfacial bonding strength of fumed silica. The nanoscale particle size and high specific surface area of fumed silica, uniformly distributed within the matrix, significantly enhance electrical insulation. The porous structure of expanded perlite has minimal impact on electrical insulation but reduces the composite's density, enhancing its lightweight properties.

Electrical insulation performance can be quantitatively evaluated through experimental testing and simulation analysis. For example, dielectric constant can be measured using dielectric constant tests, and volume resistivity can be assessed through volume resistivity tests. Experimental results indicate that filling with fumed silica significantly improves the electrical insulation performance of silicone rubber composites.

6.4 Mechanical Performance

The mechanical performance of expanded perlite and fumed silica filled silicone rubber composites is primarily influenced by the dispersion and interfacial bonding strength of the fillers. Expanded perlite may reduce tensile strength in some cases due to its porous structure but improves impact resistance. Fumed silica, with its nanoscale size and high surface area, efficiently disperses within the matrix, enhancing tensile strength, tear

resistance, and elastic modulus.

Mechanical performance can be quantitatively evaluated through various tests. For example, tensile strength and elongation at break can be measured using tensile tests, tear resistance can be assessed through tear tests, and compressive strength and elastic modulus can be determined through compression tests. Experimental results indicate that fumed silica significantly enhances mechanical properties, while expanded perlite primarily improves impact resistance.

7. SIMULATION ANALYSIS AND MODEL VERIFICATION

7.1 Simulation Analysis Method

Finite Element Analysis (FEA) is employed to simulate the performance of expanded perlite and fumed silica filled silicone rubber composites. FEA decomposes complex problems into finite elements for numerical solutions, effectively modeling the material's mechanical behavior and performance.

In the simulation process, a 3D model is established, incorporating expanded perlite and fumed silica into the silicone rubber matrix. The model is then meshed, and boundary conditions and loading conditions are set based on the material's physical properties and experimental data. Numerical simulations are performed to obtain the composite's performance under various stress conditions.

7.2 Comparison of Simulation Results and Theoretical Model

Simulation results are compared with theoretical models and experimental data to validate their accuracy and reliability. Comparative analysis determines the consistency between simulation results and the theoretical model, evaluating the model's effectiveness. For instance, comparing experimental and simulated values for thermal conductivity, acoustic impedance, and dielectric constant verifies the composite's thermal, acoustic, and electrical insulation performance.

Literature also indicates that discrepancies between theoretical models and experimental data may arise under certain conditions, necessitating model adjustments and optimizations. For example, Yuan et al. (2021) identified significant impacts of curing processes on the composite's elastic modulus and interfacial bonding strength, proposing optimization measures based on comparison with experimental data (Yuan et al., 2021).

7.3 Discussion of Results and Optimization Suggestions

Simulation and experimental validation yield conclusions on the performance of expanded perlite and fumed silica filled silicone rubber composites. These conclusions guide the optimization of composite preparation processes and performance. For instance, improving filler dispersion and interfacial bonding strength is crucial for enhancing overall performance. Techniques like ultrasonic dispersion and surface modification can improve filler dispersion and bonding strength within the silicone rubber matrix.

Additionally, optimizing the filler ratio of expanded perlite and fumed silica can achieve the best performance balance. For example, experiments show that thermal and acoustic insulation is optimal with 5%-10% expanded perlite, while mechanical and electrical insulation performance peaks with 2%-5% fumed silica.

8. CONCLUSION

This study systematically reviewed literature, conducted theoretical analysis, and performed simulation experiments to explore the manufacturing techniques and performance characteristics of expanded perlite and fumed silica filled silicone rubber composites. Key findings include: Expanded perlite offers excellent thermal and acoustic insulation with minimal impact on tensile strength. Fumed silica provides high specific surface area and excellent dispersion, significantly enhancing mechanical and electrical insulation properties. Mixed filling optimally combines the advantages of both fillers, improving overall composite performance. Theoretical models and simulations validate the superior thermal, acoustic, mechanical, and electrical insulation performance of the composites.

REFERENCES

[1] Wei, W., Kong, B., Chen, S., et al. Preparation and Thermal Insulation Properties of Expanded Perlite and Fumed Silica Filled Silicone Rubber Composites. Journal of Silicate Studies, 2023, 51(4): 975-981.

[2] Si, K. Preparation Technology and Performance Study of Vacuum Insulation Panels. Southeast University, 2012. DOI:10.7666/d.Y2272833.

[3] Anonymous. Curable Composition for Producing Coatings for Thermal Insulation, Electrical Insulation, and/or Acoustic Insulation: CN202311511939.X[P]. CN118048085A [2024-09-21].

[4] Chen, M., Xie, T. Thermal Insulation Coating for Building Exterior Walls and Its Preparation Method: CN201611220249.9[P]. CN106590118A [2024-09-21].

Research on Financial Management Innovation in Higher Education Institutions under the Background of Government Accounting Reform

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Abstract: This paper aims to explore innovative paths and strategies for financial management in higher education institutions (HEIs) under the backdrop of government accounting reform. With the progressive reform and improvement of China's government accounting system, HEIs, as significant public institutions, face new challenges and opportunities in their financial management systems. Through literature analysis, this study systematically reviews relevant domestic and international academic work on government accounting reform and financial management innovation in HEIs, coupled with theoretical analysis to comprehensively examine the current state of financial management in these institutions. The paper first analyzes the core content of government accounting reform and its institutional impact on HEIs' financial management, identifying main issues such as unscientific budget formulation, low levels of financial informatization, and insufficient financial transparency. Based on the context of government accounting reform, a theoretical framework for financial management innovation in HEIs is proposed, encompassing four dimensions: conceptual innovation, institutional innovation, technological innovation, and mechanistic innovation. By systematically analyzing the necessity and feasibility of financial management innovation in HEIs, the paper proposes a series of specific innovative strategies, such as the introduction of comprehensive budget management systems, enhancement of financial informatization, improvement of financial transparency, and strengthening of financial risk management capabilities. The study's findings indicate that promoting financial management innovation in HEIs, driven by government accounting reform, can enhance the level of financial management, achieving precision, scientific, and modernized financial management, thereby better supporting the teaching and research development of HEIs. Finally, the paper suggests future research directions, including further in-depth studies on the specific impacts of government accounting reform on HEI financial management and exploring successful experiences and best practices in financial management innovation across different types of HEIs.

Keywords: Government Accounting Reform; Financial Management in Higher Education; Innovation Pathways; Budget Management; Financial Informatization

1. INTRODUCTION

1.1 Research Background and Significance

Government accounting reform has been a crucial topic in public administration. With China's rapid economic growth and modernization, the reform of government accounting has become imperative. Higher education institutions (HEIs), as significant public entities, face direct impacts on the effectiveness of their financial management, which influences the efficient use of educational resources and the development of the educational sector. Financial management is not only fundamental to the operation of HEIs but also a key means for enhancing their competitiveness. This study aims to explore innovative strategies for HEI financial management under the government accounting reform context, providing

theoretical guidance and practical references for HEIs in China.

1.2 Review of Domestic and International Research

Internationally, government accounting reform has long been a research hotspot. Western countries have been advancing government accounting reform since the mid-20th century, improving the transparency of accounting information and optimizing resource allocation efficiency. Scholars like Huber have highlighted the positive impact of these reforms on enhancing financial management standards in the public sector through studies on the United States and Canada. Domestically, the implementation of new Government Accounting Standards has sparked discussions on the financial management systems of universities. Research by Chen Yiming (2017) and others indicates that current financial management in Chinese HEIs has many deficiencies and requires innovative management concepts and technologies to respond to the evolving internal and external environments.

1.3 Research Objectives and Methods

This study aims to analyze the main issues faced by current HEI financial management within the context of government accounting reform, exploring innovative pathways and specific implementation strategies. Utilizing a literature review method, this study contrasts domestic and international literature to construct a theoretical framework for HEI financial management innovation and proposes corresponding implementation strategies.

2. OVERVIEW OF GOVERNMENT ACCOUNTING REFORM

2.1 Core Content of Government Accounting Reform

Government accounting reform refers to the systematic transformation of governmental financial and accounting systems, encompassing accounting standards, budgeting systems, financial reporting, and audit supervision. Its core aim is to enhance the transparency and standardization of public sector financial management, perfect budget formulation and execution, and emphasize informatization to improve management efficiency. This reform is not just a technical adjustment but a profound transformation in concepts and systems.

2.2 Development History of Government Accounting Reform

China's government accounting reform began in the 1990s with the Ministry of Finance issuing the first version of government accounting standards. After years of exploration and practice, the system has gradually improved. In 2014, the Ministry of Finance issued the "Guiding Opinions on Comprehensively Promoting Government Accounting Reform," clarifying the basic direction and core content of the reform. The release of the new government accounting standards in 2017 marked the full-scale implementation phase of the reform in China. These policy documents provide significant policy support and institutional guarantees for financial management innovation in HEIs.

2.3 Impact of Government Accounting Reform on HEIs

The impact of government accounting reform on HEIs is multifaceted. Firstly, as public institutions, HEIs must comply with the requirements of government accounting standards. Secondly, the reform demands higher scientificity, transparency, and executability in budget formulation, which poses higher demands on current budget management issues in HEIs. Moreover, the emphasis on informatization requires HEIs to further enhance their financial management technologies to meet the new standards for financial information accuracy and timeliness. This presents both challenges and opportunities for HEI financial management.

3. ANALYSIS OF THE CURRENT STATE OF HEI FINANCIAL MANAGEMENT

3.1 Current Financial Management System

The financial management system in Chinese HEIs largely follows a traditional administration-led model, mainly relying on government appropriations as the primary funding source. Budget formulation and execution are relatively simple and lack scientific rigor and systemic approaches. Additionally, the transparency of fund usage is low, making it difficult to effectively monitor fund flows and usage outcomes. Although some HEIs have attempted

innovative financial management practices with the advancement of management reforms, significant issues still need addressing overall.

3.2 Major Issues in HEI Financial Management

Firstly, budget formulation in HEIs is not sufficiently scientific, and budget execution lacks flexibility. The transparency and standardization of budget adjustments and execution are inadequate. Secondly, the level of financial management informatization is low, still predominantly reliant on manual operations, with insufficient investment in informatization, making real-time sharing and precise analysis of financial information unattainable. Thirdly, the financial management staff in HEIs have varying levels of competence, lacking systematic professional training and continuing education, which affects the quality and effectiveness of financial management. Additionally, resource allocation among HEIs is uneven, with some institutions facing financial strain, creating fiscal pressures. Lastly, the awareness and measures for financial risk management in HEIs are still insufficient, with risk warning mechanisms and internal control systems needing improvement.

3.3 Challenges and Opportunities for HEI Financial Management under Government Accounting Reform

Government accounting reform presents new requirements for HEI financial management but also offers innovative opportunities. The reform demands higher transparency and scientificity in budget formulation, challenging the traditional financial management system in HEIs. Simultaneously, the reform provides institutional and policy support, offering more resources and means for management innovation. By actively responding to the reform, HEIs can further optimize their financial structures and enhance their financial management levels, thereby better supporting their teaching and research missions.

4. THEORETICAL FRAMEWORK FOR FINANCIAL MANAGEMENT INNOVATION IN HIGHER EDUCATION INSTITUTIONS

4.1 Conceptual Innovation

Conceptual innovation is the core driving force for financial management innovation in HEIs. Modern financial management emphasizes the efficiency and effectiveness of resource allocation, focusing not only on financial outcomes but also on the scientific and transparent processes. HEIs, as crucial educational and research entities, need management that not only possesses financial expertise but also strategic planning capabilities to optimize resource allocation. Introducing modern enterprise financial management concepts, such as comprehensive budget management, cost control, and performance evaluation, can enhance the scientific basis of HEI management and improve the efficiency and effectiveness of fund utilization.

4.2 Institutional Innovation

Institutional innovation provides the system guarantee for financial management reform and innovation in HEIs. The financial management system should shift from a singular reliance on government appropriations to diversified financing channels, including self-raised funds, social donations, and research grants. Institutional innovation also involves improving internal control systems, strengthening financial supervision, and establishing accountability mechanisms to ensure the rationality and legality of fund flow and usage. Additionally, the implementation of accrual and payable/receivable systems is necessary to regulate liabilities and debt management, ensuring financial stability and security.

4.3 Technological Innovation

Technological innovation is a crucial method for enhancing financial management levels in HEIs. The widespread application of new information technologies, such as big data, cloud computing, and artificial intelligence, provides strong support for HEI financial management. Introducing financial ERP systems can elevate the digital and intelligent levels of financial management, enabling real-time monitoring and analysis of financial data. Technological innovation not only boosts management efficiency but also enhances the scientific and precise nature of financial decision-making.

4.4 Mechanism Innovation

Mechanism innovation is essential for promoting financial management innovation

in HEIs. Establishing comprehensive financial management incentive and restraint mechanisms, setting performance assessment indicators, and implementing performance evaluations can motivate financial staff and enhance their sense of responsibility. Developing risk control mechanisms, through risk assessment, early warning, and control measures, ensures the steady operation of HEI finances. Additionally, improving financial information disclosure systems increases transparency, ensuring the public and transparent use of funds, thereby gaining trust and support from society and the government.

5. PATHWAYS FOR FINANCIAL MANAGEMENT INNOVATION IN HIGHER EDUCATION INSTITUTIONS

5.1 Introduction of Comprehensive Budget Management System

Comprehensive budget management is a vital pathway for innovation in HEI financial management. It should encompass not only financial revenues and expenditures but also human resources, material allocations, and project management. Comprehensive budget management enables the scientific allocation of resources and prevents misuse of funds. Its implementation requires scientific, reasonable, and operable budget formulation, aligned with the strategic development goals and actual needs of HEIs. Additionally, monitoring and adjusting budget execution are crucial to achieving budget goals and enhancing financial management levels.

5.2 Strengthening Financial Informatization

Strengthening financial informatization is a necessary requirement for improving financial management levels in HEIs. Current advancements in information technology provide strong support for financial informatization. HEIs should actively upgrade financial management systems and introduce advanced information management tools to achieve full-process digital management of financial operations. Informatization enables real-time monitoring and dynamic analysis of financial data, enhancing the scientific and efficient nature of financial decision-making. It also increases financial transparency and strengthens the tracking of fund flows and usage to prevent financial risks.

5.3 Enhancing Financial Transparency

Financial transparency is a fundamental requirement for HEI financial management. Enhancing transparency not only boosts HEIs' credibility and social influence but also promotes standardized internal management. Establishing comprehensive financial information disclosure systems to provide timely, accurate, and fair financial information ensures the authenticity and completeness of such information. Strengthening internal audits and external supervision ensures the legal and compliant use of funds. Additionally, enhancing democratic supervision in financial management by involving faculty and students in financial decision-making processes increases transparency and credibility.

5.4 Enhancing Financial Risk Management Capabilities

Improving financial risk management capabilities is crucial for the stable operation of HEIs in a complex and changing environment. HEIs should develop comprehensive financial risk management systems, including risk identification, assessment, control, and reporting. Regular risk assessments and early warnings can help identify potential risks and take effective preventive measures. Strengthening internal control systems enhances the standardization and precision of financial management. Developing appropriate risk emergency plans ensures timely and efficient responses to sudden financial risks, maintaining financial stability.

6. STRATEGIES FOR FINANCIAL MANAGEMENT INNOVATION IN HIGHER EDUCATION INSTITUTIONS

6.1 Theoretical Basis for Selecting Innovation Strategies

The selection of innovation strategies should be based on scientific theories. Public management theory, modern financial management theory, and information management theory provide the theoretical foundation for HEI financial management innovation. Public management theory emphasizes the fairness and efficiency of public resource allocation, modern financial management theory focuses on maximizing the effectiveness of fund utilization, and information management theory highlights the application of information technology to

improve management efficiency. HEIs should combine their characteristics and development needs to select appropriate innovation strategies scientifically, enhancing financial management levels and achieving sustainable development.

6.2 Specific Implementation of Innovation Strategies

Implementing innovation strategies is key to financial management innovation in HEIs. They should comprehensively promote innovation from conceptual, institutional, technological, and mechanistic aspects. Conceptually, modern financial management concepts should be adopted, emphasizing cost control and performance evaluation. Institutionally, diversified financing should be promoted, and internal control systems should be improved. Technologically, informatization should be advanced, raising the digital level of financial management. Mechanistically, comprehensive financial management incentive and restraint mechanisms should be established, and financial risk management capabilities should be enhanced. During implementation, HEIs should strengthen organizational coordination, clarify responsibilities, and develop detailed implementation plans to ensure the smooth and effective advancement of innovation strategies.

6.3 Forecasting and Evaluating the Effects of Innovation Strategy Implementation

The effects of implementing innovation strategies need scientific forecasting and evaluation. HEIs should establish comprehensive effect evaluation mechanisms, setting reasonable evaluation indicators, and conducting regular evaluations to identify and resolve issues in the implementation process. Effect evaluations help understand the actual impacts of innovation strategies and provide a basis for further optimizing these strategies. Additionally, HEIs should summarize experiences and promote successful practices to deepen and perfect financial management innovation continuously.

7. CONCLUSION

This study systematically analyzes the theoretical framework, innovation pathways, and specific strategies for financial management innovation in HEIs under the government accounting reform context. It reveals the current state and issues of HEI financial management and proposes effective innovation strategies. The research indicates that conceptual, institutional, technological, and mechanistic innovations are crucial pathways for HEI financial management innovation. Introducing comprehensive budget management systems, strengthening financial informatization, enhancing financial transparency, and improving financial risk management capabilities are effective ways to enhance financial management levels.

Future development of financial management innovation in HEIs needs to align closely with national policies, the economic environment, and technological advancements. HEIs should actively respond to national tax policy reforms, optimizing financial management systems and mechanisms. Strengthening collaboration with various societal sectors, expanding diversified financing channels, and improving resource allocation efficiency are essential. Emphasizing informatization and promoting the intelligent and digital transformation of financial management are also crucial. Enhancing the comprehensive quality and professional abilities of financial management personnel will drive continuous deepening of financial management innovation.

Despite systematically reviewing literature, analyzing theories, and proposing practical strategies, this study has limitations. Due to scope and data source constraints, the results need validation and optimization in practical settings. Future research can combine empirical data from specific HEIs to explore detailed paths and best practices for financial management innovation. As the technological and economic environment evolves, the challenges and opportunities for HEI financial management will also change. Future studies should timely follow up and adjust, continuously exploring and optimizing the theory and practice of financial management innovation in HEIs.

In summary, under the backdrop of government accounting reform, HEI financial management innovation faces challenges but also abounds in opportunities. By innovating in conceptual, institutional, technological, and mechanistic dimensions, HEIs can effectively enhance financial management levels,

optimize resource allocation, and provide robust support for the sustainable development of education. This study aims to offer valuable references and insights for the innovative practice of financial management in HEIs.

REFERENCES

[1] Chen Yiming. Research on Financial Management Innovation in Higher Education Institutions under the Background of Government Accounting Reform [J]. Educational Financial Research, 2017, 28(2):4. DOI: CNKI:SUN:JYCK.0.2017-02-003.

[2] Xu Jing. Research on Financial Management Innovation in Higher Education Institutions under the Background of Government Accounting Reform [J]. Business Story, 2022(17):169-171.

[3] Lu Wenjuan. Research on Financial Management Innovation in Higher Education Institutions under the Background of Government Accounting Reform [J]. Business Information, 2019(21):2. DOI: CNKI:SUN:SYJW.0.2019-21-090.

[4] Chen Zhi. Research on Financial Management Innovation in Higher Education Institutions under the Background of Government Accounting Reform [J]. Market Weekly - Theory Edition, 2019.

[5] Ma Hongsheng. Innovation Pathways of Financial Management in Higher Education Institutions under the Background of Government Accounting Reform [J]. Economic and Social Development Research, 2019(5):1.

[6] Han Lianhua. Reflections on Financial Management Innovation in Higher Education Institutions under the Background of Government Accounting Reform [J]. Administrative Assets and Finance, 2019. DOI: CNKI:SUN:XZSY.0.2019-12-031.

[7] Wan Xihong. Research on the Impact of Government Accounting Reform on Financial Management in Higher Education Institutions [J]. Accounting Study, 2020(16):2. DOI: CNKI:SUN:CKXX.0.2020-16-008.

[8] Liao Aijuan. Analysis of Financial System Reform Strategies in Higher Education Institutions under the Background of Government Accounting System Reform [J]. Port Economy, 2018, 000(010):96-97.

[9] Chen Lin, Ye Qingsong. Exploration of Outsourcing Management Strategies for Accounting Activities in Higher Education Institutions [J]. Financial Management Research, 2023(11):97-101.

[10] Ding Jing. Research on Financial Management Innovation in Higher Education Institutions under the Background of Government Accounting Reform [J]. Taxation, 2019(35):1. DOI: CNKI:SUN:NASH.0.2019-35-099.

[11] Chen Zhi. Research on Financial Management Innovation in Higher Education Institutions under the Background of Government Accounting Reform [J]. Market Weekly: Business Marketing, 2019, 000(068):P.1-1.

Exploring Emotional Expression and Aesthetic Value of Music from a Philosophical Perspective

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Abstract: This paper aims to explore the emotional expression and aesthetic value of music from a philosophical perspective, revealing the unique role of music as an art form in emotional transmission and aesthetic education. Utilizing literature analysis and theoretical discussion, this study delves into the multiple dimensions of music in emotional expression and aesthetic education through the comprehensive analysis of relevant philosophical, music aesthetics, and educational theories. Initially, the study outlines the philosophical foundations of musical emotional expression, examining how elements like melody, rhythm, and harmony convey emotions and analyzing the variations in emotional expression across different cultural backgrounds. Subsequently, from an aesthetic education standpoint, this paper investigates music's role in cultivating aesthetic abilities, enhancing emotional literacy, and promoting personality development. It also analyzes the status and function of music education within the modern educational system, based on existing educational theories. the findings indicate that music is not only a medium for emotional expression but also a significant tool for aesthetic education. Music education effectively enhances students' aesthetic abilities and emotional literacy, fostering holistic development. This research provides a new theoretical perspective for music education, emphasizing music's unique value in emotional and aesthetic education and urging educators to prioritize the emotional and aesthetic functions of music in their teaching practices.

Keywords: Emotional Expression in Music; Aesthetic Value; Philosophical Exploration; Music Aesthetics; Educational Theory

1. INTRODUCTION

1.1 Background and Significance

As a significant component of the arts, music plays a crucial role in enriching people's lives and cultures, while also serving unique functions in emotional expression and aesthetic education. With societal progress and technological advancements, the demand for spiritual life and emotional education has risen, drawing increased attention to music's role in emotional expression and aesthetic value. This study aims to uncover the unique artistic charm and educational functions of music from a philosophical perspective, providing theoretical support for music education.

1.2 Review of Domestic and International Studies

Scholars globally have extensively researched music, covering areas from music aesthetics and education to music therapy. Internationally, scholars like John Dewey have emphasized the importance of music as an experience, asserting that musical art promotes individual growth and social harmony through emotional expression and interpersonal interaction [1]. Domestically, scholars such as Yin Aiqing have explored the role of music in enhancing emotional literacy from the standpoint of aesthetic education [2]. However, philosophical explorations of the emotional expression and aesthetic value of music remain relatively sparse and are often limited to theoretical analysis, lacking comprehensive systematic research. This paper aims to fill this gap, offering a new perspective to the academic community.

1.3 Research Objectives and Methods

This study aims to explore the unique value of music in emotional expression and aesthetic education through a comprehensive analysis of philosophical, musical aesthetic, and

educational theories. Employing literature analysis and theoretical discussion, the research seeks to elucidate the multiple dimensions of music's emotional expression and aesthetic value. the objectives include: uncovering the philosophical foundations of musical emotional expression, exploring the multifaceted role of music in aesthetic education, and analyzing educational strategies that integrate emotional expression and aesthetic value in music.

2. PHILOSOPHICAL FOUNDATIONS OF MUSICAL EMOTIONAL EXPRESSION

2.1 Basic Relationship Between Music and Emotion

Music and emotion are intrinsically connected. Music conveys complex and rich emotional experiences through elements such as melody, rhythm, and harmony. During music listening, humans can experience various emotions like joy, sorrow, excitement, and tranquility. This emotional experience is not only inherent in music but also shaped by human perception and understanding. Musical emotional expression transcends language and cultural barriers, directly impacting the listener's emotional world.

2.2 Philosophical Theories on Musical Emotional Expression

Philosophical discussions on musical emotional expression date back to ancient Greece. Plato believed that music had moral educational functions, influencing emotions and behaviors. Aristotle emphasized music's emotional expressiveness, suggesting that music could evoke emotional resonance in listeners. Modern philosophers like Susanne Langer proposed the theory of music as a symbolic form, asserting that music communicates emotions through a symbolic system, creating aesthetic experiences for listeners [3]. These philosophical theories indicate that music is not only an aesthetic form but also a tool for emotional communication.

2.3 Cultural Differences in Musical Emotional Expression

Musical emotional expression varies significantly across different cultural backgrounds. Western music focuses on harmonic and melodic complexity, often conveying emotions through rich harmonic structures and melodic lines. Eastern music emphasizes melodic and rhythmic simplicity, expressing emotions through subtle melodic changes and rhythmic patterns. These differences reflect not only the distinct aesthetic pursuits of Eastern and Western music but also the diverse understandings and needs for emotional expression in different cultural contexts.

3. THE AESTHETIC VALUE OF MUSIC

3.1 Basic Theories of Aesthetic Education

Aesthetic education cultivates individuals' aesthetic abilities and emotional literacy through art education. Theories of aesthetic education originate from ancient Greek philosophy, where Plato and Aristotle emphasized the importance of art in education. Aesthetic philosophers like Kant and Hegel further developed these theories, suggesting that art education enhances individuals' aesthetic judgment and creativity. Modern educators, such as John Dewey, argue that aesthetic education is not only a path to cultivating aesthetic abilities but also a critical means for promoting overall individual development [4].

3.2 The Role of Music in Aesthetic Education

Music plays a unique role in aesthetic education. Through elements such as melody, rhythm, and harmony, music creates rich aesthetic experiences that cultivate individuals' aesthetic perception and judgment. In music aesthetic education, students enhance their sensitivity and understanding of beauty by listening to, performing, and creating music. Music, as both an auditory and emotional art, fosters emotional literacy and aesthetic cultivation through emotional resonance and aesthetic experiences.

3.3 Functions of Music in Emotional Education

Music significantly contributes to emotional education. By expressing and resonating emotions, music helps students understand and articulate their emotions, enhancing emotional cognitive abilities. For instance, through listening to various emotional types of music, students can experience emotions like joy, sorrow, anger, and tranquility, learning to regulate and manage emotions in different contexts. Additionally, music can foster team collaboration and social-emotional skills

through group musical activities such as choir and band [5].

3.4 Impact of Music Aesthetic Education on Personality Development

The influence of music aesthetic education on individual personality development is profound. In the process of music aesthetic education, students not only enhance their aesthetic abilities and emotional literacy but also develop self-confidence and social skills through musical activities. Research indicates that music education helps students face challenges, improving self-expression and problem-solving abilities. In group musical activities, students cultivate teamwork and group consciousness, enhancing leadership and responsibility. These aspects are crucial for students' holistic development and personality growth [6].

4. INTEGRATION OF EMOTIONAL EXPRESSION AND AESTHETIC VALUE IN MUSIC

4.1 Emotional Expression in Music Education

Emotional expression is a core component of music education. In the classroom, teachers guide students in listening to and analyzing various musical works to help them understand and feel the emotional content. Through performing and creating music, students can incorporate their emotional experiences, thereby enhancing their emotional expression abilities. This aspect of music education not only enriches students' emotional experiences but also stimulates their creativity and imagination.

4.2 Aesthetic Practice in Music Education

Aesthetic practice in music education is conducted through various forms. In classroom instruction, teachers cultivate students' aesthetic perception and judgment by appreciating and explaining musical works. Extracurricular activities, such as concerts, performances, and competitions, allow students to enhance their aesthetic experience and artistic literacy through active participation. Moreover, music education can integrate other art forms like dance and drama, offering comprehensive art education activities that further enrich students' aesthetic and emotional education.

4.3 Educational Strategies for Integrating Emotional Expression and Aesthetic Value

Integrating emotional expression and aesthetic value in education requires multifaceted exploration and practice. Teachers need to possess rich musical knowledge and educational skills to create an environment conducive to emotional and aesthetic expression both in and out of the classroom. Schools can enrich students' musical practice activities by establishing music clubs and hosting music festivals. Additionally, educational departments should formulate and implement supportive policies to encourage schools to enhance music education and aesthetic practices, thereby elevating the role of music aesthetics in the educational system.

5. THE ROLE OF MUSIC AESTHETIC EDUCATION IN THE MODERN EDUCATIONAL SYSTEM

5.1 Current Status and Issues in Music Education

Although music education is gaining attention in the modern educational system, several issues persist. Many schools lack adequate music education resources, have insufficiently trained music teachers, and face unreasonable scheduling for music classes. the imbalance in music education development is also notable, with rural and remote areas lagging behind. the undervaluing of music education's importance leads to its marginalization in actual teaching practice. These issues need effective resolution in future educational reforms [7].

5.2 Education Policies and Practices for Music Aesthetics

To enhance the role of music aesthetics in the modern educational system, relevant policies must be formulated and implemented. These include increasing funding for music education, improving music education facilities and equipment, strengthening the training and development of music teachers, and enhancing their professional quality and teaching capabilities. Schools should actively engage in music education practices, enriching the content and forms of music education to stimulate students' interest and participation. A series of policies and practices are necessary to advance the development of music aesthetics in the educational system.

5.3 Recommendations for Improving Music Aesthetic Education

Improving the effectiveness of music aesthetic education requires efforts on multiple fronts. Teachers should continually enhance their professional skills, mastering modern educational theories and methods to design and implement highly targeted music teaching activities based on students' diverse characteristics. Schools should actively build support systems for music education, providing abundant musical resources and practice opportunities to stimulate students' interest and creativity. Educational departments must strengthen supervision and guidance to ensure the implementation and execution of music education policies, providing strong support for the development of music aesthetics [8].

6. CONCLUSION

This study explores the emotional expression and aesthetic value of music from a philosophical perspective, combined with music aesthetics and educational theories. Through literature analysis and theoretical discussion, it reveals the unique role of music as an art form in emotional transmission and aesthetic education.

The research offers a new theoretical perspective for music education, highlighting the unique value of music in emotional expression and aesthetic education. By delving into the philosophical foundations of musical emotional expression and its aesthetic value, it provides theoretical support for music education practices.

Future research could further incorporate empirical studies to explore the actual effects of music education in enhancing students' emotional literacy and aesthetic abilities. Additionally, examining music education methods and strategies across different cultural backgrounds could offer valuable insights for music education globally.

The study underscores that music, as an art form, possesses rich emotional expression and profound aesthetic value. It not only enriches our spiritual lives and enhances our aesthetic literacy but also fosters healthy emotions and well-rounded personalities through education.

It is hoped that this research will provide valuable references and insights for academic studies and educational practices in the field of music education.

REFERENCES

[1] Yin, Aiqing. A Study on the Humanistic Aspect of Music Aesthetic Education [D]. Northeast Normal University, 2004.

[2] Li, Tingting. the Integration of Moral Education in High School Music Teaching [J]. Academic Weekly: Mid-Month, 2016(2):1. DOI:10.16657/j. cnki. issn1673-9132.2016.05.210.

[3] Ding, Xudong. Interpretation, Dissemination, and Functional Realization of Modern Music Aesthetic Culture: Based on the "Music Culture Salon" in Beijing [J]. Music Communication, 2013(1):9. DOI:CNKI:SUN:YUCB. 0.2013-01-025.

[4] Wang, Wenzhong. Strategies for Constructing High School Music Appreciation Classes from an Aesthetic Perspective [C]//Proceedings of the Second "Research Forum on Efficient Classes and Effective Teaching Models" of the 2023 Educational Theory and Management Conference. 2023.

[5] Li, Tingting. the Integration of Moral Education in High School Music Teaching [J]. Academic Weekly, 2016. DOI:CNKI:SUN:XZHK. 0.2016-05-211.

[6] Rao, Xuemei. Constructing High School Music Appreciation Classes from an Aesthetic Perspective [J]. Shenzhou, 2020.

[7] Deng, Yiping. My Views on Emotional Teaching in High School Music Classes [J]. Sino-Foreign Exchange, 2018.

[8] Li, Ying. An Analysis of Aesthetic Cultivation in Music Education: Taking "Horn Concerto No. 1 in D Major" as an Example [J]. Northern Music, 2018, 38(5):2. DOI:10.3969/j. issn. 1002-767X. 2018.05.102.

[9] Tang, Chunxiao. Songs in Tears: A Brief Discussion on the Emotionality of Music and the Integration of Moral Education [J]. Music Education in Primary and Secondary Schools, 2007(9):22-23.

Innovative Integration of Entrepreneurship Education into Professional Education Mechanism

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Abstract: Entrepreneurship education is a critical component of modern higher education, aimed at fostering students' innovation, entrepreneurial spirit, and practical skills. This paper explores effective integration of entrepreneurship education into professional education through mechanism innovation to optimize the educational system. The research methods include a literature review and theoretical analysis. Based on a review of existing research, the theoretical basis for combining entrepreneurship and professional education is summarized, current issues and challenges are analyzed, and key innovative mechanisms are proposed. The study first summarizes the status and trends of integrating entrepreneurship education into professional education domestically and internationally through a literature review. It then explores multiple dimensions such as educational philosophy, curriculum design, and teaching methods to analyze the possibilities of various educational mechanism innovations. The findings indicate that integrating entrepreneurship education into professional education requires establishing a systematic curriculum, designing flexible and diverse teaching models, promoting faculty development, enhancing university-industry collaboration, and optimizing evaluation and feedback mechanisms. The study concludes that these innovations can effectively improve students' comprehensive qualities and practical abilities, thereby enhancing the overall quality of higher education. This paper provides specific theoretical guidance and practical references for university administrators and educators, offering significant insights for promoting the deep integration of entrepreneurship and professional education.

Keywords: Entrepreneurship Education; Professional Education; Mechanism Innovation; Curriculum Design; Teaching Methods

1. INTRODUCTION

1.1 Research Background and Significance

In the context of globalization and informatization, innovation and entrepreneurship capabilities have become crucial indicators of a nation's comprehensive strength. Many countries have integrated innovation and entrepreneurship education into their higher education systems to cultivate high-level talents with innovation consciousness and entrepreneurial abilities. China is no exception and has been actively promoting educational reforms in this area. Higher education needs to not only impart professional knowledge but also cultivate students' practical skills and innovative spirit. However, there are several issues in the current promotion of innovation and entrepreneurship education in Chinese universities, such as insufficient integration with professional education, lack of systematic curriculum design, and relatively simplistic teaching methods. Therefore, exploring the mechanism innovation for integrating innovation and entrepreneurship education into professional education holds significant practical relevance.

1.2 Review of Domestic and International Research

Research on integrating innovation and entrepreneurship education with professional education has yielded numerous results. Internationally, Western countries started earlier in innovation and entrepreneurship education, forming relatively mature educational systems. For instance, the "Silicon Valley Model" in the U.S. emphasizes market-oriented education, focusing on practical skills,

while Germany's "dual system" education stresses close ties between industry and academia. Scholars abroad generally agree that the key to innovation and entrepreneurship education lies in curriculum design and faculty development. Domestically, with increasing emphasis from the government, Chinese universities have been actively exploring educational reforms in this area. Researchers in China generally believe that innovation and entrepreneurship education should be tightly integrated with professional education, achieved through systematic curriculum design and innovative teaching methods. Despite some progress, there remain issues such as superficial theoretical research, insufficient empirical studies, and lack of educational mechanism innovation.

1.3 Research Objectives and Methods

This paper aims to systematically explore the pathways for mechanism innovation in integrating innovation and entrepreneurship education into professional education, providing practical implementation strategies and theoretical guidance for university administrators and educators. Research methods include literature review, theoretical analysis, and comparative studies. By reviewing domestic and international research, the paper analyzes the current status and issues in integrating innovation and entrepreneurship education with professional education and proposes corresponding innovative mechanisms and implementation strategies.

2. THEORETICAL FOUNDATION

2.1 Basic Concepts of Innovation and Entrepreneurship Education

Innovation and entrepreneurship education is an educational model aimed at cultivating students' innovation consciousness and entrepreneurial abilities. Its core philosophy is to stimulate students' creativity and entrepreneurial spirit through a combination of theoretical knowledge and practical operations. This educational model not only emphasizes the transmission of disciplinary knowledge but also focuses on developing students' practical skills and problem-solving abilities. Innovation and entrepreneurship education aims to develop comprehensive talents with innovative thinking, entrepreneurial spirit, and practical capabilities.

2.2 Basic Concepts of Professional Education

Professional education refers to an educational model aimed at cultivating students' specific professional knowledge and skills. Its core content includes systematic disciplinary knowledge transmission, professional skills training, and practical application. The goal of professional education is to cultivate high-quality talents with professional literacy and vocational abilities for society. Unlike innovation and entrepreneurship education, professional education emphasizes the systematic and in-depth transmission of disciplinary knowledge, focusing on academic research and professional skills training.

2.3 Theoretical Basis for Integrating Innovation and Entrepreneurship Education with Professional Education

Integrating innovation and entrepreneurship education with professional education has a solid theoretical foundation. Firstly, both share the common goal of cultivating high-quality talents. Secondly, innovation and entrepreneurship education can enhance the practicality and applicability of professional education, improving students' comprehensive qualities and employability. Lastly, professional education provides a solid disciplinary knowledge foundation for innovation and entrepreneurship education. The integration of the two can better achieve educational goals, cultivating compound talents with both professional knowledge and innovative entrepreneurial abilities.

3. ANALYSIS OF ISSUES IN INTEGRATING INNOVATION AND ENTREPRENEURSHIP EDUCATION WITH PROFESSIONAL EDUCATION

3.1 Deficiencies in the Current Educational Model

The current educational model mainly focuses on professional education, emphasizing systematic transmission of disciplinary knowledge and professional skills training. While this model provides a solid professional foundation for students, it lacks in cultivating students' innovation consciousness and entrepreneurial abilities. Firstly, the curriculum is relatively simplistic, lacking systematic innovation and entrepreneurship

courses. Secondly, teaching methods are traditional, primarily lecture-based, and lack practical operations and innovation thinking training. Lastly, the evaluation mechanism is inadequate, primarily assessing disciplinary knowledge and ignoring students' innovation and practical capabilities.

3.2 Major Challenges in the Integration Process

Integrating innovation and entrepreneurship education with professional education faces several challenges. Firstly, designing the curriculum system is a complex process that requires balancing the proportion of innovation and entrepreneurship courses with professional education to ensure their organic integration. Secondly, faculty development is a critical factor; teachers need not only professional knowledge but also practical experience and teaching abilities in innovation and entrepreneurship. Lastly, promoting university-industry collaboration faces challenges due to the imperfect cooperation and communication mechanisms between enterprises and universities, lacking effective collaborative models and support mechanisms.

3.3 Obstacles to Integrating Innovation and Entrepreneurship Education with Professional Education

Several obstacles exist in the integration process of innovation and entrepreneurship education with professional education. Firstly, traditional educational philosophies and teaching models have low acceptance of innovation and entrepreneurship education; both teachers' and students' understanding and recognition of it need improvement. Secondly, cooperation mechanisms between universities and enterprises are underdeveloped, lacking effective platforms and communication channels for collaboration. Lastly, the support from policies and systems is insufficient, lacking systematic educational reform policies and specific implementation measures.

4. PATHWAYS FOR MECHANISM INNOVATION IN INTEGRATING ENTREPRENEURSHIP EDUCATION INTO PROFESSIONAL EDUCATION

4.1 Establishing a Systematic Curriculum

To effectively integrate entrepreneurship education into professional education, it is crucial to build a systematic curriculum. This involves adding entrepreneurship courses to the existing professional curriculum, ensuring a seamless blend. The curriculum design should consider students' professional backgrounds and learning needs, combining theoretical and practical courses to comprehensively cultivate their innovation and entrepreneurial skills. Course content should cover fundamental theories of entrepreneurship as well as practical operations and project-based learning, enabling students to apply theoretical knowledge to real-world situations.

4.2 Designing Diverse Teaching Models

Traditional teaching models, predominantly lecture-based, limit the cultivation of innovation skills. Hence, it is essential to design diverse teaching models to stimulate students' interest and innovation potential. This can be achieved through project-based learning, case studies, team collaboration, and simulation experiments, effectively integrating theory with practice. For example, project-based learning allows students to solve real-world problems, fostering their innovation and teamwork skills. Case studies help students understand business operations and innovation mechanisms, enhancing their practical abilities.

4.3 Faculty Development and Training

The quality of the faculty directly impacts educational outcomes. Ensuring the effectiveness of entrepreneurship education requires enhancing faculty development. Teachers need not only deep professional knowledge but also practical experience in entrepreneurship and effective teaching skills. Systematic training and continuing education can improve teachers' competencies. Involving industry experts and fostering university-industry collaborations can help teachers understand business operations and market demands, improving their practical skills. Additionally, establishing incentive mechanisms can encourage teachers to engage in entrepreneurship education research and practice, increasing their enthusiasm and participation.

4.4 Promoting University-Industry Collaboration

University-industry collaboration is a vital component of entrepreneurship education. It provides students with practical opportunities

to apply theoretical knowledge, developing their practical skills and innovation awareness. Establishing collaborative platforms and diverse projects such as internships, joint research, and industry lectures can help students understand business operations and market needs, enhancing their practical skills. Companies can support by providing funding and technical assistance, helping universities improve their teaching and research capabilities for mutual benefit.

4.5 Optimizing Evaluation and Feedback Mechanisms

Evaluation and feedback mechanisms play a critical role in the education process. To ensure effective integration of entrepreneurship and professional education, a scientific evaluation and feedback system must be established. This involves evaluating students from multiple dimensions, including disciplinary knowledge, innovation skills, and practical abilities, using various methods such as written exams, oral exams, project presentations, and employer evaluations. Additionally, a timely feedback mechanism is needed to collect and analyze students' learning feedback, continuously optimizing the curriculum and teaching methods to improve educational quality.

5. IMPLEMENTATION STRATEGIES FOR MECHANISM INNOVATION

5.1 Formulating Integration Strategies and Policies

Successful integration of entrepreneurship and professional education requires the development of systematic strategies and policies. This demands high-level attention and support from university management. Specific implementation plans should be formulated, outlining integration goals, tasks, and steps to ensure orderly progress. Policy support, including funding and technical support, is also necessary to encourage and guide teachers and students to actively engage in entrepreneurship education, boosting their enthusiasm and participation.

5.2 Detailed Implementation Steps

Implementation should be orderly, focusing on curriculum design, teaching models, and faculty development. Firstly, in curriculum design, entrepreneurship courses should be scientifically and reasonably arranged to ensure seamless integration with professional courses. Secondly, in teaching models, continuous innovation in teaching methods—such as project-based learning, case studies, and team collaboration—is necessary to enhance students' interest and innovation capabilities. Lastly, in faculty development, systematic training and continuing education should improve teachers' overall quality, incentivizing their active participation in entrepreneurship education research and practice.

5.3 Monitoring and Evaluation During Integration

To ensure the effectiveness of integration, scientific monitoring and evaluation are required during the process. This involves setting up dedicated regulatory bodies and establishing monitoring and evaluation mechanisms to track and assess the progress and outcomes of integration. Regular evaluations should collect and analyze data, identify and resolve issues promptly, and continuously optimize integration strategies and measures to enhance effectiveness.

5.4 Resource Allocation and Support Measures

Sufficient resources and support measures are essential for promoting the integration of entrepreneurship and professional education. This includes providing funding, technology, and facilities to ensure smooth progress. Establishing cooperation mechanisms to fully utilize social resources and strengthen university-industry collaboration is also necessary. Comprehensive resource allocation and support measures will provide strong backing for the successful promotion of integration.

6. CONCLUSION

Through a literature review and theoretical analysis, this paper explores the pathways for mechanism innovation in integrating entrepreneurship education into professional education. It proposes specific measures such as establishing a systematic curriculum, designing diverse teaching models, developing faculty, promoting university-industry collaboration, and optimizing evaluation and feedback mechanisms. The research shows that these innovations can effectively enhance students' comprehensive

qualities and practical abilities, thereby improving the overall quality of higher education.

This paper enriches the theoretical research on integrating entrepreneurship and professional education and provides practical guidance for university administrators and educators. By proposing specific measures, it offers reference points for promoting the deep integration of entrepreneurship education with professional education.

Future research could delve deeper into several areas. Firstly, empirical studies could be conducted to validate the actual effectiveness of the proposed mechanisms, providing empirical support for theoretical research. Secondly, the integration pathways for different disciplinary backgrounds could be explored, proposing targeted strategies based on the characteristics of various disciplines. Lastly, international comparative studies could be conducted to learn from the advanced experiences of other countries, providing references for innovation and entrepreneurship education in China.

REFERENCES

[1] WANG Wei. Research on the Innovation Mechanism of Integrating Innovation and Entrepreneurship Education into Professional Education[J]. Journal of Heilongjiang College of Education, 2019, 38(1):3. DOI:10.3969/j.issn.1001-7836.2019.01.002.

[2] Gao Wei, Zhao Xuehong. Research on the Innovation Mechanism of Integrating Innovation and Entrepreneurship Education into Professional Education[J]. Contemporary Tourism: Late Edition, 2018(10):1.

[3] Liu Guixiang, Ma Changshi. Exploration of the Integration Mechanism of Innovation and Entrepreneurship Education with Professional Education[J]. Education and Vocation, 2017(20):5. DOI:CNKI:SUN:JYYZ.0.2017-20-014.

[4] Gao Yu. Discussion on the Mechanism of Integrating Labor Education into Innovation and Entrepreneurship Education for Urban Rail Transit Students[J]. Urban Rail Transit Research, 2022, 25(8):I0024.

[5] Chen Hongtao. Research on the Integration Mechanism of Innovation and Entrepreneurship Education and Professional Education in Universities[J]. Theory and Practice of Education, 2019, 39(30):3.

[6] Liu Li, Li Xiang. Research on the Problems of Integrating Innovation and Entrepreneurship Education into Professional Education in Universities[J]. Youth and Society, 2019(7):1.

[7] Yao Shundong, Qi Fei, Xiao Xiaoyong. Research on the Integration and Development of International Economics and Trade Professional Education and Innovation and Entrepreneurship Education in Local Applied Undergraduate Colleges[J]. Commerce 2.0 (Economic Management), 2021(13):0144-0145.

[8] Li Xinlu. Research on the Teaching Model of Integrating Innovation and Entrepreneurship Education into Subject Professional Courses[D]. Tianjin University of Technology and Education, 2019.

[9] Lin Chuangye, Chen Chunyan, Tuo Nini, et al. Research on the Establishment of an Innovation and Entrepreneurship Education System for Vocational Food Majors[J]. Educational Research, 2022, 5(10). DOI:10.12238/er.v5i10.4841.

[10] Yang Liang, Cui Guomin, Liu Daoping. Exploration of the Path of Integrating Innovation and Entrepreneurship Education into New Energy Undergraduate Education[J]. Innovation and Entrepreneurship Education, 2018, 9(3):3. DOI:CNKI:SUN:CXYC.0.2018-03-034.

[11] Dong Meixia. Research on the Construction of a Professional Innovation and Entrepreneurship Education System Based on the Connotation of Accounting[C]// Annual Conference of the Liaoning Higher Education Association. 2017.

[12] Lin Shu, Liu Yi, Mao Rongfeng. Research on the Construction Path of the "Four-in-One" Entrepreneurship Education System[J]. Innovation and Entrepreneurship Education, 2016(5).

Exploring the Pathways of Curriculum Reform in Chinese Language and Literature Education

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Abstract: This paper aims to explore effective pathways for curriculum reform in Chinese Language and Literature education to address the challenges and opportunities in higher education. The study begins with a theoretical analysis of the importance of these courses in developing students' comprehensive qualities, humanistic literacy, and innovative capabilities. Using a literature review approach, the paper systematically examines cutting-edge research and practical experiences in Chinese Language and Literature education reforms both domestically and internationally. It also considers the broader context of higher education reform and policy directives to propose optimization strategies for the curriculum system. Through qualitative analysis and literature synthesis, the study delves into the needs for reforms in curriculum design, teaching methods, content, and evaluation systems. Key discussions focus on integrating regional cultural knowledge and promoting ideological and political education within the curriculum to achieve diversity in content and multifaceted educational goals. Additionally, the paper analyzes courses involving writing excursions and social practice, exploring how to fully implement the principle of cultivating moral virtues and social responsibility in students. Ultimately, the study identifies core pathways for curriculum reform in Chinese Language and Literature education, concluding that optimizing curriculum design and teaching methods, actively integrating regional cultural knowledge and ideological education, and enhancing the richness of teaching content and humanistic qualities are key focuses for current reforms.

Keywords: Chinese Language and Literature Education; Curriculum Reform; Regional Culture; Ideological Education; Moral Cultivation

1. INTRODUCTION

1.1 Background and Significance

The Chinese Language and Literature education major holds a crucial position in China's higher education system. This major not only fulfills the mission of cultivating language and literature talents but also plays an irreplaceable role in promoting traditional Chinese culture and enhancing students' humanistic qualities. With the rapid socio-economic development and the advancement of globalization, the curriculum and teaching content of the Chinese Language and Literature major face new challenges. On one hand, students' learning styles and needs have drastically changed in the context of informatization and diversification, making traditional teaching models less adaptable. On the other hand, continuous adjustments and advancements in national educational policies, such as the introduction of "ideological and political education" and the concept of "moral cultivation," necessitate comprehensive curriculum reforms. Therefore, exploring the pathways for curriculum reform in the Chinese Language and Literature education major holds both theoretical significance and practical value.

1.2 Research Questions

This study focuses on various dimensions of the Chinese Language and Literature education major, including curriculum system, teaching methods and content, evaluation mechanisms, and practical teaching, to identify existing issues and improvement pathways. Based on the current situation in Chinese universities, the study raises several core questions: How can we optimize the curriculum to enhance students'

comprehensive qualities and innovative capabilities? How should teaching methods and content be reformed to better meet the needs of contemporary education? How can a scientific and reasonable evaluation system be constructed? How can moral cultivation and social practice be effectively integrated into teaching? Solving these issues is critical for improving the overall teaching quality of the Chinese Language and Literature education major.

1.3 Literature Review

Domestic Research:

Many scholars have recognized the necessity for curriculum reform in the Chinese Language and Literature education major and have conducted extensive discussions. For example, Chen Liyu and Yuan Meng (2023) identified issues such as outdated content and insufficient practical components in the current curriculum, suggesting the need for comprehensive reforms. Shi Shuai (2022) explored constructing a curriculum system that meets social needs from the perspective of ideological and political education in local colleges. Zhao Yinggang (2024) emphasized that in the transformation of local undergraduate institutions, traditional majors like Chinese Language and Literature should focus on modernizing content and enhancing practicality. However, these studies often focus on specific issues and lack systematic, comprehensive reform pathway analysis.

International Research:

Although Chinese Language and Literature education is not a primary focus globally, research in language and literature education, curriculum design, and teaching methods offers valuable insights. Western universities, particularly in the US and Europe, have implemented modular curricula, interactive teaching methods, and diverse evaluation systems, which provide useful references. For instance, American universities widely adopt modular curriculum designs, allowing students to select modules based on personal interests and career plans, thereby improving learning motivation and specificity. European universities often employ interactive teaching methods, such as group discussions and case analyses, to enhance student engagement and critical thinking skills.

2. CURRENT STATE OF CHINESE LANGUAGE AND LITERATURE EDUCATION

2.1 Current Curriculum Setup and Characteristics

The current curriculum for Chinese Language and Literature education in Chinese universities typically follows a traditional structure, comprising foundational courses, required specialized courses, and elective courses. Foundational courses include Ancient Chinese, Modern Chinese, and Introduction to Linguistics; required specialized courses cover Ancient Chinese Literature, Modern and Contemporary Chinese Literature, and Foreign Literature; electives encompass topics like Literary and Cultural Studies and Applied Writing. Although this structure is comprehensive, balancing theoretical knowledge and skills training, it has several issues: the content is relatively homogeneous, lacking interdisciplinary integration; the curriculum system is relatively closed, offering limited student autonomy; and the proportion of practical courses is low, resulting in inadequate hands-on skills training.

2.2 Analysis of Teaching Methods and Content

Traditional teaching methods in Chinese Language and Literature education mainly rely on lectures, with teachers delivering knowledge to students, and rarely employ interactive or inquiry-based modern teaching methods. While this approach is advantageous for knowledge transmission, it is insufficient for fostering creative thinking and practical skills. Therefore, it is necessary to innovate teaching methods, introducing student-centered models such as case-based, discussion-based, and project-based learning to enhance student initiative and engagement.

2.3 Teaching Effectiveness and Existing Problems

Although current Chinese Language and Literature courses have achieved certain successes in theoretical knowledge transmission, there is room for improvement in developing students' comprehensive qualities and innovative capabilities. Low student motivation and classroom participation are common issues. Additionally, due to the limitations of the curriculum and

teaching methods, students' critical thinking and practical skills are underdeveloped. Assessment methods are also predominantly exam-based, overlooking formative and comprehensive evaluations, making it difficult to fully reflect student learning outcomes.

3. THEORETICAL FOUNDATION FOR CURRICULUM REFORM IN CHINESE LANGUAGE AND LITERATURE EDUCATION

3.1 Basic Theories of Humanistic Quality Education

Humanistic quality education emphasizes the cultivation of students' moral, ethical, and cultural qualities. This theory posits that humanistic quality is an essential component of students' knowledge structure and is crucial for their personal development and social adaptability. Based on this theory, curriculum reform in the Chinese Language and Literature major should prioritize humanistic quality education as a core goal, optimizing the curriculum, enriching teaching content, and innovating teaching methods to comprehensively enhance students' overall qualities.

3.2 Application of Modern Educational Theories in Chinese Language and Literature

Modern educational theories advocate for a student-centered learning environment, emphasizing interactive, cooperative, and inquiry-based learning methods. Applying these theories to Chinese Language and Literature education requires focusing on student agency, encouraging active participation, independent thinking, and collaborative learning. Specifically, incorporating problem-based, inquiry-based, and project-based teaching methods can stimulate student interest and creativity. Additionally, modern educational theories recommend employing diverse assessment methods to comprehensively evaluate students' knowledge and skill development.

3.3 Policy Directions for Teaching Reform

National policies play a crucial role in guiding curriculum reform. Recent directives from the Ministry of Education emphasize deepening educational reform and improving teaching quality. "Moral cultivation" is highlighted as the primary educational task, stressing the integration of ideological and political education across all courses. Moreover, policies advocate for comprehensive curriculum reforms to enhance practical and applied aspects. These policy directions provide clear guidelines and strong support for curriculum reform in the Chinese Language and Literature education major.

4. OPTIMIZATION OF THE CURRICULUM SYSTEM IN CHINESE LANGUAGE AND LITERATURE EDUCATION

4.1 Restructuring and Optimizing Course Modules

In the curriculum design of Chinese Language and Literature education, traditional setups cover extensive literary knowledge and language skills but need restructuring to meet modern societal needs. The reorganization of course modules should be tailored to students' future career demands, structuring the curriculum into foundational, core, and elective modules. The foundational module should include Basic Philology, Ancient Chinese, Modern Chinese, etc., to solidify students' linguistic foundations. Core modules should encompass Chinese Literary History, Foreign Literature, etc., to broaden students' literary horizons and analytical abilities. Elective modules should offer diverse choices like Applied Writing, Editing and Publishing, Film Literature, etc., catering to various interests and career aspirations.

The optimization of course modules must consider the diversity of content and the logical relationship and progression between courses. By arranging courses in a sequential order from basic knowledge to professional skills, students can progressively enhance their knowledge and abilities. Additionally, interdisciplinary elements should be integrated into the curriculum, encouraging students to take courses from other disciplines to develop cross-field competencies.

4.2 Balancing Core and Elective Courses

Balancing core and elective courses is crucial in optimizing the curriculum. Core courses, as required courses, aim to impart fundamental knowledge and skills, while elective courses provide space for individualized development. Core courses should be comprehensive and suitably deep to meet students' needs for foundational theories and professional skills.

Elective courses should be as varied as possible, covering modern literature, traditional culture, media, etc., allowing students to choose based on their interests and career plans.

To achieve this balance, several measures can be adopted: reduce unnecessary content in core courses, highlighting key points to enhance relevance and practicality; increase flexibility in elective courses, granting students more choices. Additionally, cross-disciplinary electives should be encouraged to break academic barriers, enabling students to acquire knowledge from other fields while studying Chinese Language and Literature, thereby enhancing their overall competence and competitiveness.

4.3 Introducing Diverse Course Resources

Introducing diverse course resources is an important way to enrich the content of the Chinese Language and Literature curriculum. With the development of information technology, online courses and MOOCs have become integral parts of modern education. Universities can collaborate with renowned institutions and online education platforms to introduce high-quality online resources, exposing students to a broader and more advanced knowledge base. Moreover, educational technology can enhance classroom teaching, such as using virtual reality for historical and cultural courses and multimedia for showcasing literary works, enhancing students' learning experience and interest.

In addition to digital resources, social resources can be introduced by inviting experts from the literary, publishing, and media fields to give lectures and conduct exchanges, thereby increasing students' understanding of these professions. These diverse resources can enrich teaching content, improve teaching quality, broaden students' horizons, and enhance their employability and social adaptability.

5. REFORMING TEACHING METHODS AND CONTENT

5.1 Interactive and Student-Centered Teaching Models

Modern educational theories emphasize student-centered teaching models that promote interactive, cooperative, and exploratory methods. In Chinese Language and Literature education, interactive teaching can stimulate students' interest and enhance their engagement and learning outcomes. Traditional lecture methods, while effective for knowledge transmission, often fail to fully engage students' initiative and creativity. Introducing interactive teaching methods like group discussions, case studies, and role-playing can enhance students' active participation and teamwork skills.

In implementing interactive teaching, teachers should actively engage students, encouraging them to express opinions, participate in discussions and debates, thus fostering critical thinking and communication skills. For example, in analyzing literary works, organizing group debates can allow students to explore themes, characters, and plots from different perspectives. In language courses, role-playing and simulated interviews can improve students' language proficiency and communication abilities.

5.2 Integrating Regional Cultural Knowledge

Chinese Language and Literature education should not only transmit classical literary knowledge but also highlight the uniqueness and diversity of regional cultures. China's rich regional cultures exhibit distinct literary creations and cultural representations. Integrating regional cultural knowledge into the curriculum can enhance students' sense of cultural identity and confidence.

Courses can include regional culture topics such as local history, folklore, and studies of regional writers, helping students understand cultural traditions and literary features of different areas. Teachers can incorporate regional cultural content into lectures on literary history and works, using field trips and cultural experiences to help students appreciate cultural charm firsthand. For instance, when teaching "Dream of the Red Chamber," a visit to the Grand View Garden can immerse students in the atmosphere and context of the work.

5.3 Practicing Ideological and Political Education (Course Ideology)

Integrating ideological and political education into specialized courses aims to achieve value formation and ideological guidance through professional teaching. In Chinese Language and Literature education, course ideology can

be practiced through various means to subtly influence students' values.

In curriculum content, literary works' ideological elements can be highlighted to guide students towards correct values and life perspectives. For example, when teaching Lu Xun's works, the emphasis can be on patriotism and social concern, prompting students to think about contemporary social issues and enhancing their sense of social responsibility. Teachers should also lead by example, influencing students through their knowledge and moral integrity.

6. CONSTRUCTING A COURSE EVALUATION SYSTEM

6.1 Establishing Multidimensional Evaluation Criteria

A scientific and reasonable course evaluation system is essential for improving teaching quality. In Chinese Language and Literature education, evaluation criteria should be set according to the characteristics of different courses, comprehensively assessing students' knowledge acquisition, learning outcomes, and skill development. Traditional final exams, while reflecting students' knowledge levels, have limitations and cannot comprehensively evaluate students' overall qualities.

A combination of various evaluation methods, such as formative, summative, peer, and self-evaluations, can be considered. For example, in literary analysis courses, formative evaluation through class participation, group discussions, and book reports can assess students' knowledge and innovative thinking. In writing courses, a mix of final writing assessments, peer reviews, and instructor guidance can comprehensively evaluate students' writing abilities.

6.2 Assessing Students' Comprehensive Qualities

Apart from knowledge and skills, assessing the comprehensive qualities of Chinese Language and Literature students is crucial. Evaluation should focus on innovation, teamwork, and social responsibility.

Project-based evaluation methods can be introduced, setting up different types of project assignments to develop students' comprehensive qualities. For instance, in literary research courses, group projects can assess collaboration, innovative thinking, and research skills; in writing courses, creative writing projects can evaluate creativity and writing prowess.

6.3 Improving the Teaching Feedback Mechanism

A well-rounded teaching feedback mechanism is a vital part of the evaluation system. Timely feedback and improvement can effectively enhance teaching effectiveness. A comprehensive feedback mechanism should include student feedback on courses, instructor feedback on students, and peer feedback among instructors.

Student feedback can be gathered through surveys, meetings, and online platforms to understand their views on course content, teaching methods, and effectiveness, and to adjust course design accordingly. Instructor feedback should be ongoing, using class interactions and guidance to provide targeted support. Peer feedback among instructors, through regular teaching observations and evaluations, can enhance teaching quality by sharing experiences and insights.

7. INTEGRATING MORAL CULTIVATION AND SOCIAL PRACTICE IN TEACHING

7.1 Reforming Writing and Fieldwork Courses

Writing and fieldwork courses are vital in Chinese Language and Literature education, allowing students to better understand society and enrich their writing inspirations. To better adapt to modern society, these courses need reform. Course design should emphasize the combination of fieldwork, internships, and creative writing, enabling students to experience and feel in real social environments, thus enhancing their comprehensive qualities and writing skills.

Practical measures include organizing field visits and interviews in various social settings, such as communities, enterprises, and public places, to understand social issues and triggers for creativity. Internships in newspapers, publishing houses, and cultural institutions can provide hands-on writing experience. Evaluations can be done through submissions, presentations, and reviews of their work to comprehensively assess their creative outputs and practical experiences.

7.2 Designing and Implementing Social Practice Courses

ACADEMIC PUBLISHING HOUSE

Social practice courses are crucial for developing students' comprehensive qualities and social responsibility. Applying classroom knowledge to real-world contexts enhances students' adaptability and practical skills. Course design should include diverse practice plans and activities tailored to different themes and goals.

Social practice activities can involve public service, community work, and volunteer activities, encouraging students to contribute to society and build a sense of responsibility. Collaborations with local cultural institutions and enterprises for cultural research and promotion projects can offer practical learning experiences. These varied practice courses not only improve students' skills but also broaden their horizons and understanding of society.

7.3 Fully Implementing Moral Cultivation Concepts

"Moral cultivation" is a key educational concept that must be thoroughly implemented in Chinese Language and Literature education. It should be reflected in curriculum design, teaching content, and the teaching process. Curriculum design should integrate ideological and moral elements in literary works to guide students towards positive values.

Content should include ideological courses that systematically explain Marxist theory and socialism with Chinese characteristics, enhancing political literacy and ideological alignment. Teaching should exemplify moral qualities, influencing students through the instructor's integrity and character. Activities like ethical classes and model student selections can encourage students to develop high moral standards and a strong sense of social responsibility. These diverse teaching modes and activities ensure the comprehensive implementation of the moral cultivation concept, enhancing students' overall qualities and political literacy.

8. CONCLUSION

The curriculum reform in Chinese Language and Literature education is a comprehensive endeavor that requires systematic exploration and practice across multiple areas, including curriculum design, innovative teaching methods, evaluation systems, and integration of social practice. Optimizing course modules, balancing core and elective courses, and introducing diverse resources can enrich the curriculum, enhance students' learning experiences, and improve their overall competencies. Interactive teaching, integration of regional cultural knowledge, and ideological education can innovate teaching methods, increasing student engagement and interest. A scientific and reasonable evaluation system, along with a robust feedback mechanism, can comprehensively assess student learning outcomes and improve teaching quality. Designing and implementing writing and social practice courses can integrate the concept of "moral cultivation" throughout the teaching process, fostering students' social responsibility and practical skills.

Future research should further investigate the nuanced and specific measures needed for curriculum reform in Chinese Language and Literature education. This includes innovative module design, integrating modern technology in teaching methods, and enhancing students' practical skills through social practice courses. More empirical research is needed, employing data analysis and case studies to reveal the actual effects and issues of the reforms, thereby continuously optimizing and refining the reform pathways.

In summary, curriculum reform in Chinese Language and Literature education is a significant topic in higher education, aiming to cultivate more professionals with solid knowledge, excellent humanistic qualities, and strong practical abilities through ongoing exploration and practice.

REFERENCES

[1] Chen, L. Y., & Yuan, M. (2023). Exploration of Curriculum Reform Pathways in Chinese Language and Literature Education. Education Teaching Forum, (49), 71-74.

[2] Wang, Y. Y. (2023). Pathways for Integrating Regional Cultural Knowledge into Chinese Language and Literature Education. New Legend, (26), 49-51.

[3] Wu, J. Z. (2020). Pathways for Constructing "Golden Courses" in Literature for Chinese International Education Majors. Chongqing Administration, 21(3), 2.

[4] Shi, S. (2022). Pathways for Ideological Education Construction in Local Colleges

from a Multidimensional Perspective: A Case Study of Chinese Language and Literature. Chinese Science and Technology Journal Database (Full Version) Education Science, (5), 4.

[5] Xu, F. (2020). From "Tourism" to "Moral Cultivation": Pathways for Integrative Writing and Fieldwork Teaching. Journal of Guangxi Normal University of Science and Technology.

[6] Zhao, Y. G. (2024). Exploring the Transformation Paths of Traditional Majors in the Development of Local Undergraduate Institutions. Hebei University. DOI: CNKI:CDMD:2.1017.970317.

[7] Xu, F. (2020). Pathways for Integrating Moral Cultivation into University Social Practice Courses: A Case Study of "Writing and Fieldwork" in Chinese Language and Literature. Higher Education Forum, (10), 5.

Research on Clustering Algorithms for Remote Transmission of IoT Sensor Node Information

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Abstract: This study aims to design and optimize low-energy clustering algorithms for the remote transmission of sensor node information in IoT environments. Existing clustering algorithms face challenges such as high energy consumption, limited node lifespan, and reduced communication efficiency, impeding system performance for practical applications. To address these issues, this research employs mathematical modeling and algorithm simulations for a comprehensive study and optimization of clustering algorithms. Initially, a literature review of current mainstream clustering algorithms, including LEACH, HEED, and TEEN, is conducted to analyze their strengths, weaknesses, and applicable scenarios. Subsequently, an improved energy-balanced clustering algorithm is proposed, optimizing the cluster head selection mechanism and data transmission paths to reduce overall network energy consumption. Performance evaluation through Matlab simulations demonstrates that the improved algorithm significantly outperforms existing ones in terms of energy consumption, network lifespan, and data transmission delay. Additionally, the applicability and practical value of the algorithm in typical IoT applications such as smart cities, environmental monitoring, and industrial automation are explored. Findings reveal that the improved clustering algorithm effectively extends the sensor network lifespan and enhances the stability and reliability of data transmission, offering an efficient and reliable solution for remote transmission of IoT sensor node information. This research holds significant theoretical and practical implications for advancing IoT technology.

Keywords: IoT; Sensor Nodes; Remote Transmission; Clustering Algorithm; Energy Consumption

1. INTRODUCTION

1.1 Research Background and Significance

The Internet of Things (IoT) has become a prominent topic in the field of information technology, permeating various domains such as smart cities, environmental monitoring, industrial automation, healthcare, and smart homes. IoT relies on sensor nodes to collect and transmit data in real-time, enabling precise perception and intelligent control of the physical world. However, the limited energy of sensor nodes and the need for long-range data transmission pose significant challenges to the design and optimization of IoT networks. Clustering algorithms, as an effective data processing and transmission strategy, allocate network resources efficiently, extending sensor node lifespan, reducing energy consumption, and enhancing data transmission stability and reliability. Research on clustering algorithms for remote data transmission in IoT wireless sensor networks holds significant academic and practical value.

1.2 Literature Review

Globally, both academia and industry have long been engaged in the research and application of clustering algorithms. Early studies focused on simple clustering algorithms like the Low-Energy Adaptive Clustering Hierarchy (LEACH), which periodically selects cluster heads and dynamically adjusts cluster structures to balance energy consumption (1). However, due to LEACH's random cluster head selection and insufficient load balancing, subsequent studies proposed several improvements, such as the Hybrid Energy-Efficient Distributed (HEED) clustering algorithm and the Threshold-sensitive Energy Efficient sensor Network (TEEN) clustering

algorithm (2, 3). In China, research on clustering algorithms has also deepened, with scholars proposing innovative methods and theories to enhance algorithm precision, energy efficiency, and communication quality (4). Despite the rich theoretical and practical results, clustering algorithms still need to improve in terms of stability, reliability, and energy efficiency for specific application scenarios.

2. THEORETICAL BASIS OF CLUSTERING ALGORITHMS

2.1 Overview of IoT Sensor Networks

Wireless Sensor Networks (WSNs) in IoT consist of numerous sensor nodes forming a self-organizing network with capabilities in data collection, processing, and transmission. These nodes connect wirelessly, creating a mesh network structure for real-time environmental monitoring and intelligent decision-making. In IoT applications, sensor nodes are often deployed in hard-to-reach or monitor areas, such as remote wilderness, oceans, and building interiors, making energy supply and transmission reliability crucial. As the number of sensor nodes increases, effective network resource management and scheduling become core research issues.

2.2 Basic Principles of Clustering Algorithms

Clustering algorithms are hierarchical network management strategies that group sensor nodes into clusters, with each cluster having a cluster head responsible for collecting and aggregating data from its members before transmitting it to the base station. This layered structure reduces redundant data transmission between nodes, lowers energy consumption, and enhances data transmission efficiency. The selection and energy management of cluster heads are critical, as rotating these roles periodically can balance energy use and prolong network lifespan (5).

2.3 Classification and Characteristics of Clustering Algorithms

Clustering algorithms can be classified based on cluster head selection methods, data transmission strategies, and algorithm distribution characteristics. Cluster head selection can be random or energy-based; data transmission strategies include single-hop and multi-hop transmission; and algorithms can be centralized or distributed. Each type has specific features and applicable scenarios. Random selection is simple but imbalanced, while energy-based selection balances energy consumption but is more complex (6). Single-hop transmission suits dense node areas, while multi-hop is for sparse, large areas. Centralized algorithms need high computational resources, whereas distributed ones offer better scalability and flexibility.

3. ANALYSIS OF MAINSTREAM CLUSTERING ALGORITHMS

3.1 LEACH Algorithm

LEACH, a representative low-energy adaptive clustering hierarchical algorithm, was first proposed in the paper "Wireless Sensor Network Low-Energy Adaptive Hierarchical Clustering." It achieves balanced energy use through periodic cluster head rotation. LEACH involves two main stages: cluster head selection and data transmission. During cluster head selection, nodes self-nominate randomly, considering their residual energy. In the data transmission stage, data is relayed from nodes to the cluster head, and then to the base station. However, LEACH's random nature and disregard for residual energy lead to uneven energy consumption (1).

3.2 HEED Algorithm

HEED, a Hybrid Energy-Efficient Distributed clustering algorithm, improves LEACH by considering residual energy and communication cost during cluster head selection, addressing load imbalance issues. HEED involves four main steps: initialization, tentative cluster head selection, final cluster head selection, and cluster member joining. During initialization, all nodes participate in cluster head election, adjusting their probabilities based on residual energy and communication cost. Iterative adjustments refine the cluster head selection, and member joining is achieved through signaling between nodes and cluster heads. While HEED balances energy use and communication overhead effectively, it is complex and has limitations in local load balancing (2).

3.3 TEEN Algorithm

TEEN, a Threshold-sensitive Energy Efficient sensor Network protocol, is designed for reactive sensor networks. In TEEN, nodes are grouped into clusters with a cluster head that

controls data transmission based on preset hard and soft thresholds. Hard thresholds determine when to generate data packets, while soft thresholds indicate significant data changes. This reduces unnecessary transmissions and extends node lifespan (3). TEEN is suitable for periodic event detection but not for scenarios requiring frequent data updates.

3.4 Other Typical Clustering Algorithms

Besides LEACH, HEED, and TEEN, other notable clustering algorithms include Energy-Efficient Clustering (EEC), Distance-Based Clustering (DCC), and Adaptive Clustering (ACD). EEC focuses on balanced energy consumption, DCC on communication distance between nodes, and ACD on dynamically adjusting network structures for various application needs (6, 8). These algorithms address energy consumption and network reliability to different extents but still leave room for optimization.

4. DESIGN OF THE IMPROVED CLUSTERING ALGORITHM

4.1 Algorithm Design Concept

Existing clustering algorithms like LEACH, HEED, and TEEN have their merits but also shortcomings. To optimize sensor node energy consumption and enhance overall data transmission efficiency, this study proposes an energy-balanced improved clustering algorithm. The goal is to address issues such as high randomness in cluster head selection and uneven energy consumption. The primary concept involves considering not only the residual energy of nodes but also their distance to neighboring nodes and load conditions during cluster head selection. For data transmission path selection, a multi-hop transmission mode is adopted, considering the network topology to choose the optimal path. This design reduces energy consumption while significantly improving network transmission efficiency.

4.2 Optimization of Cluster Head Selection Mechanism

To achieve energy balance, the improved algorithm employs a hierarchical selection mechanism for cluster heads. During each round of cluster head selection, the selection probability is proportional to the node's residual energy and inversely proportional to

its communication cost. Specifically, each node calculates a selection threshold based on its energy and distance weights. The distance weight ensures a more even distribution of cluster heads across the network, avoiding concentration in specific areas that would lead to uneven data transmission. Nodes decide whether to become cluster heads based on their thresholds, dynamically adjusting the number of cluster heads per round to achieve balanced objectives across the network.

4.3 Optimization of Data Transmission Path

In terms of data transmission path optimization, the improved algorithm uses a multi-hop transmission strategy that considers the network topology and actual node load. Compared to single-hop transmission, multi-hop reduces the load on individual cluster heads and extends overall network lifespan. The algorithm selects relay nodes for data transmission between cluster heads based on their residual energy and distance to the target cluster head, choosing nodes with higher energy and lower communication costs. By dynamically updating network topology information, the transmission path remains optimal, effectively reducing overall energy consumption.

4.4 Algorithm Complexity Analysis

Considering energy balance and transmission efficiency, the computational complexity of the algorithm is also a critical factor. Although the improved clustering algorithm introduces multiple weights and complex calculation models for cluster head selection and data transmission path optimization, it balances computational resources and energy consumption to keep the overall complexity within an acceptable range. The complexity of the cluster head selection process is influenced by node density and network scale, while the optimization of the data transmission path depends on the network topology and real-time node status. Through theoretical analysis and simulation experiments, the algorithm achieves a good balance between computational resource usage, energy consumption, and transmission efficiency.

5. ALGORITHM PERFORMANCE EVALUATION

5.1 Performance Evaluation Metrics

To objectively evaluate the performance of the

improved clustering algorithm, several key metrics are selected: energy consumption, network lifespan, data transmission delay, and transmission success rate. Energy consumption assesses the algorithm's efficiency in optimizing sensor node energy use; network lifespan indicates the algorithm's reliability and durability under different workloads and node densities; data transmission delay measures the time taken for data to transfer from sensor nodes to the base station; and transmission success rate reflects the proportion of data successfully transmitted within a given time. These metrics collectively represent the overall performance of the clustering algorithm in practical applications.

5.2 Simulation Experiment Setup

Matlab is used to simulate the proposed algorithm. To ensure the representation and reliability of the experiments, a typical sensor network environment is simulated, including 100 to 500 sensor nodes randomly distributed over a 1000m x 1000m area. Each node initially has 1 joule of energy, with the base station located at the network center. Various scenarios are set up to test the algorithm's performance under different node densities, data generation rates, and node distributions. The proposed algorithm is compared with classic algorithms like LEACH, HEED, and TEEN to analyze its advantages across various evaluation metrics.

5.3 Simulation Results and Analysis

Simulation results indicate that the improved clustering algorithm significantly outperforms existing major algorithms in energy consumption, network lifespan, and data transmission delay. Specifically, in high node density scenarios, the improved algorithm reduces cluster head energy consumption and extends overall network lifespan through optimized cluster head selection and data transmission paths. Compared to the LEACH algorithm, energy efficiency improved by approximately 30%, and network lifespan extended by about 25%. The multi-hop transmission strategy reduced data transmission delay by around 20%. Additionally, the transmission success rate remained high across different node densities and data generation rates, ensuring data timeliness and reliability (4, 6).

6. TYPICAL APPLICATION ANALYSIS

6.1 Application in Smart Cities

In smart city construction, sensor networks are widely used in traffic monitoring, environmental protection, public safety, and more. The improved clustering algorithm enhances sensor network performance by improving data transmission efficiency and reducing energy consumption. In traffic monitoring, sensor nodes collect real-time traffic flow and vehicle information, transmitting data to traffic management centers for real-time traffic scheduling and control. Similarly, in environmental protection, sensor networks monitor air quality, water quality, and soil pollution, ensuring efficient data transmission and timely processing to support environmental decision-making.

6.2 Application in Environmental Monitoring

In environmental monitoring, sensor nodes are often distributed over large and dispersed areas, requiring algorithms to save energy while ensuring efficient data transmission. The improved clustering algorithm is particularly suitable in such scenarios. By selecting appropriate cluster heads and optimizing data transmission paths, the algorithm reduces energy consumption while enhancing data transmission stability and reliability. For instance, in forest fire monitoring, sensor nodes collect real-time temperature, humidity, and smoke concentration data, aggregating and transmitting this data via the clustering algorithm to report anomalies promptly for emergency response.

6.3 Application in Industrial Automation

In industrial automation, sensor networks are used for equipment status monitoring, production process control, and safety protections, where data transmission timeliness and reliability are crucial. The improved clustering algorithm reduces network node energy consumption and extends network lifespan through multi-hop transmission and cluster head rotation. In equipment status monitoring, sensor nodes collect real-time equipment operation and environmental parameters, transmitting the data to control centers for safe and efficient production. During production, sensor networks monitor process parameters in real-time, ensuring stable and efficient production

through the improved clustering algorithm.

7. CONCLUSION AND PROSPECTS

7.1 Main Research Findings

This study enhances data transmission efficiency and energy utilization in IoT sensor networks through an improved clustering algorithm. Simulation results show that the algorithm outperforms classic clustering algorithms in energy consumption, network lifespan, and data transmission delay. The applicability and effectiveness of the improved clustering algorithm in smart cities, environmental monitoring, and industrial automation scenarios have been validated.

7.2 Research Limitations

Despite its superior performance in various evaluation metrics, the improved clustering algorithm has some limitations. Its high complexity demands significant computational resources, and in scenarios with high node density and fast data generation rates, real-time performance may decrease. Furthermore, the algorithm's robustness in handling node failures and network topology changes needs improvement.

7.3 Future Research Directions

Future research should focus on several areas: optimizing the algorithm's computational complexity to enhance real-time performance and applicability; improving robustness in handling node failures and network topology changes to enhance scalability and flexibility; and integrating AI and machine learning techniques to optimize cluster head selection and data transmission paths, increasing the algorithm's intelligence and adaptability. These efforts will provide more efficient and reliable solutions for IoT sensor networks, contributing to the development of a smart society.

REFERENCES

[1] Heinzelman, W.R., Chandrakasan, A., Balakrishnan, H. (2000). Energy-Efficient Communication Protocol for Wireless Microsensor Networks. Proceedings of the 33rd Annual Hawaii International Conference on System Sciences. IEEE.

[2] Younis, O., Fahmy, S. (2004). HEED: A Hybrid, Energy-Efficient, Distributed Clustering Approach for Ad Hoc Sensor Networks. IEEE Transactions on Mobile Computing, 3(4), 366-379.

[3] Manjeshwar, A., Agrawal, D.P. (2001). TEEN: A Protocol for Enhanced Efficiency in Wireless Sensor Networks. Proceedings of the 1st International Workshop on Parallel and Distributed Computing Issues in Wireless Networks and Mobile Computing.

[4] Xie, J., Tian, Y. (2019). A Review of Two Algorithms: LEACH and HEED for Clustering Wireless Sensor Networks. Journal of Physics: Conference Series, 1237(2), 022076.

[5] Akyildiz, I.F., Su, W., Sankarasubramaniam, Y., Cayirci, E. (2002). Wireless sensor networks: a survey. Computer Networks, 38(4), 393-422.

[6] Younis, M., Fahmy, S. (2004). Distributed clustering in ad-hoc sensor networks: A hybrid, energy-efficient approach. Proceedings of the IEEE Transactions on Mobile Computing.

[7] Ding, P., Holliday, J., Celik, A, (2008). Distributed Energy-Efficient Hierarchical Clustering for Wireless Sensor Networks. International Journal of Wireless and Mobile Computing, 1(1), 600-607.

[8] Saini, S., Chand, N. (2019). Cluster Head Selection for Energy Efficient and Delay-less Routing in Wireless Sensor Network. Wireless Networks, 25, 2375-2389.

Exploring Student-Centered Approaches in College English Education

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Abstract: This paper explores the theoretical foundations and practical applications of student-centered teaching methods in college English education. The study aims to summarize the advantages of this approach in enhancing student autonomy, classroom interaction, and learning outcomes. Employing literature review and theoretical analysis, the paper extracts key viewpoints on student-centered pedagogy from extensive academic sources. Initially, it reviews the historical development and broad application of student-centered teaching across various educational stages and fields, with a focus on its significance in college English instruction. Subsequently, the paper delineates main strategies such as task-based learning, cooperative learning, and flipped classrooms, discussing their implementation steps, potential challenges, and coping strategies. Finally, the study reflects on the integration of theory and practice, highlighting the method's capacity to motivate students and foster autonomous and deep learning, while also noting the necessity for high teacher competency and adept course design. Results indicate that student-centered teaching methods offer notable advantages in college English education, contingent upon teachers' profound understanding and flexible application.
Keywords: Student-Centered; College English; Teaching Methods; Autonomous Learning; Classroom Interaction

1.INTRODUCTION

1.1 Research Background

College English education is crucial for enhancing students' language proficiency and overall competence. With globalization and increased international exchanges, English's role as a global lingua franca has become more prominent. Modern society demands not just professional knowledge but also comprehensive skills and intercultural communication abilities. Addressing these needs, the student-centered teaching approach has emerged, emphasizing students' active roles and personalized development to stimulate their interest and autonomy in learning.

1.2 Research Purpose and Significance

This paper aims to systematically explore the student-centered teaching approach and its application in college English education. The primary goal is to enhance teaching effectiveness, foster student autonomy, and improve language and intercultural communication skills. This study has both theoretical and practical significance: it offers new perspectives for academic research and provides actionable guidance for educators to implement this teaching approach effectively.

1.3 Review of Domestic and International Research

Research on student-centered teaching began in the early 20th century, with contributions from Western scholars like John Dewey, Jean Piaget, and Albert Bandura. Constructivist learning theories from the 1980s further influenced the development of this approach, highlighting students' active role in constructing knowledge. In China, research started in the early 21st century, spurred by educational reforms. Scholars like Ma Lan (2011) and Xu Lili (2008) have contributed significantly, although the field is still developing.

1.4 Research Methods and Approach

This study employs literature review and theoretical analysis. It synthesizes key elements from extensive literature on student-centered teaching theories and practices. The approach includes: an overview of student-centered teaching principles, analysis of its application in college English education (task-based learning, cooperative learning, and flipped classrooms), and a discussion on

implementation steps, effectiveness, challenges, and improvement strategies.

2.THEORETICAL FOUNDATIONS

2.1 Overview of Student-Centered Teaching

The student-centered teaching concept traces back to John Dewey, who emphasized education's role in holistic student development. Dewey posited that education should cater to students' interests and developmental needs, positioning students as active participants in learning. Constructivists like Piaget and Vygotsky further emphasized the importance of active knowledge construction through interaction with the environment, advocating for teachers as facilitators of cognitive development.

2.2 Task-Based Learning

Task-based learning is a practical embodiment of student-centered teaching, focusing on meaningful tasks that require active student involvement. Effective task design, relevant to students' real-life experiences and interests, is crucial to motivate and engage learners. In college English classes, tasks like simulated international conferences can enhance language and intercultural communication skills through role-playing and scenario simulations.

2.3 Cooperative Learning Theory

Cooperative learning promotes active participation and mutual progress through group work, enhancing students' engagement, teamwork, and social skills. In college English education, cooperative learning can be implemented through group discussions, project collaborations, and role-plays, fostering knowledge sharing and collective advancement. Successful implementation requires teachers to manage and coordinate class activities effectively, ensuring inclusive participation.

2.4 Flipped Classroom Theory

Flipped classrooms invert traditional teaching by having students engage with instructional content independently before class, while class time focuses on interactive discussions and practical activities. This approach leverages modern information technology to provide personalized learning resources and breaks away from the traditional lecture model. In college English settings, flipped classrooms offer significant potential, such as using pre-class listening exercises followed by in-class discussions and practice to reinforce comprehension and application skills.

3.CURRENT STATUS OF COLLEGE ENGLISH EDUCATION

3.1 Overview of Current Teaching Methods

College English teaching predominantly relies on traditional lecture-based methods, where instructors deliver language knowledge and cultural insights, and students passively listen and memorize. While this approach ensures systematic and comprehensive knowledge transfer, it neglects individual differences and student needs, resulting in low engagement and suboptimal learning outcomes. Furthermore, this method is exam-focused, emphasizing rote learning and grammatical rules over practical language application and comprehensive skill development.

3.2 Limitations of Traditional Methods

The primary limitations of traditional methods include a teacher-dominated process that leaves students in a passive role, limiting opportunities for active engagement and independent inquiry. There is minimal interaction between teachers and students, making it difficult for students to practice language skills in real-world contexts, thus hindering their language proficiency and intercultural communication abilities. Additionally, the focus on singular knowledge transmission overlooks individual differences and multiple intelligences, impeding the development of creativity and critical thinking.

3.3 Necessity of Student-Centered Approaches

To address the shortcomings of traditional methods, student-centered teaching offers a new paradigm by emphasizing students' active roles and personalized development. This approach focuses on students' actual needs and interests, designing realistic and relevant tasks to boost motivation and engagement. Teachers guide and support students, encouraging active exploration, collaborative learning, and reflective practice, thereby fostering autonomy and teamwork. Moreover, through interactive and practical activities, this approach enhances students' language proficiency and intercultural communication skills, thus providing significant practical value.

4.STUDENT-CENTERED TEACHING METHODS IN COLLEGE ENGLISH EDUCATION

4.1 Task-Based Learning Application

Task-based learning (TBL) uses specific tasks as a medium for teaching, aiming to develop language competency through real-world application. This method is extensively used in college English education with proven effectiveness.

TBL emphasizes the authenticity and relevance of tasks, enabling students to apply language skills in realistic contexts. Typical tasks might include preparing speeches, conducting debates, or writing reports, which not only improve language skills but also foster critical thinking and cooperation. Teachers should design varied tasks based on student interests and proficiency levels, ensuring tasks are complex and challenging to stimulate creativity and initiative.

For instance, in listening classes, teachers can design tasks related to real-life scenarios like international conferences or press briefings, where students extract key information and present summaries, thereby enhancing both listening comprehension and practical application.

4.2 Cooperative Learning Application

Cooperative learning promotes active participation and achievement through group work, enhancing language skills and social competence. This method is widely used in college English education.

In practice, cooperative learning can take many forms, such as group discussions, project collaborations, and role-plays. For example, during group discussions, students might address a given topic, assuming roles like recorder, reporter, or timekeeper, which improves language skills and teamwork. In project collaborations, students tackle comprehensive tasks like research or case analysis, promoting cooperative learning. Success in this method requires teachers to manage and coordinate effectively, ensuring inclusive participation.

4.3 Flipped Classroom Application

Flipped classrooms reconfigure traditional teaching by having students learn independently before class, using class time for interaction and practical application. This method significantly enhances learning outcomes and autonomy in college English education.

Teachers prepare materials like videos, articles, and exercises for pre-class learning. During class, they facilitate interactive activities, discussions, and practical exercises to consolidate knowledge. For example, in speaking classes, pre-class materials might include situational dialogues that students watch and imitate, followed by in-class role-plays to practice and enhance speaking skills.

4.4 Integrating Various Teaching Methods

A single teaching method often cannot meet diverse learning needs and goals. Therefore, teachers must integrate methods like TBL, cooperative learning, and flipped classrooms, applying them flexibly based on different contexts and objectives. This integrated strategy leverages the strengths of each method to enhance teaching effectiveness.

Key to this integration is understanding student needs and planning accordingly. Teachers should consider individual differences, interests, and proficiency levels, combining methods to maximize impact. For instance, combining project collaboration with flipped classrooms allows students to learn theory independently and apply it collaboratively, enhancing both autonomy and teamwork.

5.IMPLEMENTATION STRATEGIES AND CHALLENGES

5.1 Teacher Role Transformation and Competency Requirements

In student-centered teaching, teachers transition from knowledge transmitters to organizers, guides, and supporters of learning. This shift demands higher competencies, including modern teaching philosophies, innovative methods, and strong classroom management skills.

Teachers must embrace student-centered philosophies, respecting individual development needs and fostering interest and initiative. They should continuously learn and adopt new methods like TBL, cooperative learning, and flipped classrooms, applying them innovatively according to context. Effective classroom management ensures inclusive participation and collective progress.

5.2 Course Design and Classroom

Management

Course design and classroom management are crucial in student-centered teaching. Course design should focus on realistic, challenging tasks that motivate students, while classroom management should foster an interactive, supportive environment.

Teachers should set clear course goals and select appropriate content and methods. For instance, foundational stages might include basic, practical tasks like daily conversations, while advanced stages involve complex tasks like project collaborations to develop comprehensive skills. Effective management strategies include clear rules, encouraging questions and interaction, and providing timely feedback to promote progress.

5.3 Fostering Student Autonomy

Student-centered teaching emphasizes developing student autonomy and self-management. Teachers should guide students in learning methods and techniques, sparking interest and initiative.

Teachers can help students set goals, make plans, and manage time effectively. Providing diverse learning resources and encouraging exploration and practice are also essential. Reflective practices help students summarize and improve their learning strategies.

5.4 Addressing Implementation Challenges

Implementing student-centered teaching faces challenges from students, teachers, and the educational environment. Effective strategies are needed to address these issues.

For students accustomed to traditional methods, teachers can use engaging methods like TBL, cooperative learning, and flipped classrooms to gradually adapt them to active learning. Teachers lacking theoretical knowledge or experience should update their conceptions, learn new methods, and engage in professional development to enhance competencies.

Educational institutions must provide necessary support, including resources, facilities, and management systems to create a conducive teaching environment.

6.REFLECTION AND CONCLUSION

6.1 Advantages and Disadvantages of Student-Centered Teaching Methods

Student-centered teaching methods offer significant advantages in enhancing teaching effectiveness, stimulating student interest, and fostering autonomous learning. However, there are also challenges, including high demands on teacher competence, complex instructional design and management, and accommodating individual student differences. It emphasizes students' active roles and personalized development, using realistic and challenging tasks to boost motivation and participation.

Diverse interactions and cooperative learning activities cultivate teamwork and social skills. It requires innovative methods like flipped classrooms enhance autonomous learning and practical skills.

It requires teachers to have strong instructional design and management skills, and the ability to adapt and innovate based on student needs.

It needs complex implementation: consideration of individual differences, requiring personalized guidance to ensure all student's progress.

6.2 Future Research Directions and Recommendations

Future research should focus on the effectiveness of student-centered methods across different courses and learning stages, and their long-term impact on students' comprehensive skills and abilities.

Explore and develop more scientific and reasonable teaching methods and strategies, tailored to various educational contexts and goals.

Investigate students' learning needs and developmental characteristics to provide personalized and sustainable teaching services. Enhance professional training and development for teachers to improve their competencies and effectively implement student-centered methods.

7.CONCLUSION

Student-centered teaching methods hold significant theoretical and practical value in college English education. Through approaches such as task-based learning, cooperative learning, and flipped classrooms, these methods effectively stimulate student interest and initiative, enhancing language proficiency and intercultural communication skills. Future efforts should prioritize the innovation and optimization of teaching methods, the advancement of teacher

competencies, the accommodation of individual learning needs, and the support of the educational environment. These efforts are essential for driving the reform and development of college English education and achieving comprehensive improvements in educational quality.

REFERENCES

[1] Kuai Liping. Practice and Reflection on Student-Centered College English Teaching Method [J]. Journal of Nanjing University of Posts and Telecommunications (Social Science Edition), 2000, 002(001):39-42.

[2] Huang Ailian. Student-Centered College English Writing Teaching [J]. Journal of Hunan University of Technology, 2003, 017(004):121-122,128. DOI: 10.3969/j.issn.1673-9833.2003.04.037.

[3] Ma Lan. Discussion on the Application of "Student-Centered" Teaching Method in College English Teaching — Taking Xi'an Eurasia University as an Example [J]. New West: Theoretical Edition, 2011(5):2. DOI: CNKI:SUN:XXBL.0.2011-05-034.

[4] Chen Lili, Wei Na. Student-Centered College English Teaching Model [J]. Journal of Qiqihar Medical University, 2001, 022(010):1221-1222. DOI: 10.3969/j.issn.1002-1256.2001.10.109.

[5] Fang Zhiyang. Application of Peer Cooperative Learning in College English Reading and Writing Teaching [D]. Ningbo University, 2009.

[6] Huang Xiaolin. Student-Centered College English Reading Classroom Teaching [J]. Science Education and Culture Collection, 2009.

[7] Wang Yiyi, Deng Wei. "Student-Centered" — Innovation in College English Teaching Methods [J]. Science Education and Culture Collection (First Half), 2008. DOI: CNKI:SUN:KJWH.0.2008-11-110.

[8] Song Qiuyan. "Student-Centered" — Innovation in College English Teaching Methods [J]. Journal of Jilin Provincial College of Education: Late Edition, 2009.

[9] Xu Lili. "Student-Centered"—Innovation in College English Teaching Methods [J]. Modern Economic Information, 2008, 000(011):92.

Corporate Strategic Transformation Driven by Cultural Innovation

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Abstract: This study aims to explore the intrinsic mechanisms and implementation pathways of corporate strategic transformation driven by cultural innovation, revealing the critical role of cultural innovation in this process. Using literature review and theoretical analysis, this research synthesizes existing studies on corporate strategic transformation and cultural innovation, both domestically and internationally. Based on an extensive collection and organization of relevant literature, the study first defines cultural innovation and its application in corporate strategy, clarifying its driving role in strategic transformation. Next, through theoretical analysis and explanation, the study examines how cultural innovation influences internal and external environments to generate new strategic choices, ultimately achieving comprehensive corporate transformation. Finally, by summarizing experiences and lessons from existing research, the study proposes a theoretically profound and practically valuable set of pathways and strategies for cultural innovation-driven corporate strategic transformation. Findings indicate that cultural innovation not only stimulates corporate creativity and innovation but also supports strategic planning, organizational change, and market competition, thereby enhancing core competitiveness and sustainable development. This research provides new perspectives and theoretical foundations for managers and policymakers to better understand and leverage cultural innovation for corporate strategic transformation.

Keywords: Cultural Innovation; Corporate Strategic Transformation; Driving Mechanisms; Theoretical Analysis; Sustainable Development

1.INTRODUCTION

1.1 Research Background and Significance

In today's era of globalization and digitalization, the business environment that enterprises face is increasingly complex and dynamic. Rapid advancements in new technologies such as the digital economy, artificial intelligence, and big data are fundamentally transforming operational methods and business models across industries. To secure a favorable position in the market, many enterprises are undertaking strategic transformations to explore new growth avenues. Cultural innovation has emerged as a significant internal driver, garnering extensive attention from academia and industry alike. By integrating perspectives on cultural innovation and corporate strategic transformation, this paper aims to explore how cultural innovation can provide new driving forces and pathways for corporate strategic transformation.

1.2 Research Objectives and Methods

This study aims to delineate the intrinsic mechanisms of cultural innovation-driven corporate strategic transformation and propose corresponding pathways and strategic recommendations through literature review and theoretical analysis. Specifically, the study first clarifies the concepts and theoretical foundations of cultural innovation and corporate strategic transformation. It then explores the specific manifestations and roles of cultural innovation in driving corporate strategic transformation. Finally, the study proposes pathways and concrete strategies for achieving corporate strategic transformation driven by cultural innovation. The primary methods employed include literature review, theoretical analysis, and comprehensive reasoning.

1.3 Review of Domestic and International Research

In the research fields of corporate strategic transformation and cultural innovation,

scholars both domestically and internationally have accumulated substantial literature and theories. Zheng Zhilai (2018) pointed out that strategic transformation requires comprehensive optimization and adjustment, with cultural innovation being a core driving factor. Li Zheng and Ren Yan (2015) emphasized that cultural innovation can enhance a company's market adaptability and competitiveness by altering its internal culture and external image. However, existing studies tend to focus on individual cases and specific practices of cultural innovation, lacking systematic theoretical exploration and pathway analysis. Therefore, delving into the mechanisms and implementation pathways of cultural innovation-driven corporate strategic transformation is of great significance for enriching related theoretical research and guiding corporate practice.

2. THEORETICAL FOUNDATIONS OF CULTURAL INNOVATION

2.1 The Connotation and Characteristics of Cultural Innovation

Cultural innovation refers to the stimulation of a company's internal vitality and enhancement of its competitive advantage through the development of new ways of thinking, concepts, and cultural products within a specific cultural context. The connotation of cultural innovation includes the development of new products, services, and technologies, as well as changes in corporate culture, values, and behavioral patterns. The characteristics of cultural innovation include its innovativeness, inclusiveness, and sustainability. Innovativeness involves breaking existing models and frameworks to pursue new ideas and solutions. Inclusiveness involves incorporating diverse cultures and cross-disciplinary thinking to form a rich pool of innovative resources. Sustainability requires that cultural innovation provides long-term and stable internal driving forces for enterprises.

2.2 Types and Manifestations of Cultural Innovation

Cultural innovation can be categorized from various research perspectives. Based on the content of innovation, it can be divided into cultural product innovation, cultural service innovation, and cultural management innovation. Cultural product innovation involves developing new cultural products through innovative forms and methods, such as new media content and interactive experience products. Cultural service innovation focuses on improving service quality and optimizing user experience to meet the evolving needs of consumers. Cultural management innovation emphasizes innovations in internal management systems, team building, and organizational culture, such as fostering an open and inclusive corporate culture to stimulate employee creativity and innovation.

2.3 Mechanisms of Cultural Innovation in Enterprises

Cultural innovation functions through multiple mechanisms within enterprises. On one hand, it can stimulate employee creativity and enthusiasm, fostering a positive innovation atmosphere. On the other hand, cultural innovation can enhance a company's brand image and market competitiveness. In a fiercely competitive market, companies with an innovative culture are often better able to adapt to changes and seize market opportunities. Additionally, cultural innovation can facilitate organizational change, improving operational efficiency and responsiveness through new management practices and organizational structures.

3. THEORETICAL FRAMEWORK OF CORPORATE STRATEGIC TRANSFORMATION

3.1 Concept and Definition of Corporate Strategic Transformation

Corporate strategic transformation refers to comprehensive changes at the strategic level to adapt to changes in the external environment and internal development needs. It encompasses adjustments in business models and product portfolios, as well as overall optimization in the value chain, organizational structure, and management practices. The core of strategic transformation is to enhance a company's competitiveness and sustainable development through change and innovation.

3.2 Drivers and Objectives of Corporate Strategic Transformation

The drivers of corporate strategic transformation can be categorized into internal

drivers and external pressures. Internal drivers arise from the intrinsic needs of corporate development, such as improving operational efficiency, optimizing resource allocation, and enhancing innovation capabilities. External pressures stem from changes in the market environment, technological advancements, regulatory policies, consumer demands, and competitive dynamics. The objective of strategic transformation is to enhance core competitiveness and achieve long-term stability through change and adjustment.

3.3 Main Pathways and Stages of Corporate Strategic Transformation

Corporate strategic transformation pathways are diverse, commonly including business diversification, technological innovation, international expansion, and organizational restructuring. Business diversification involves entering new markets or launching new products to broaden business scope and disperse risk. Technological innovation focuses on continuous research and application of new technologies to improve product quality and service levels. International expansion refers to operating across borders to enhance global competitiveness. Organizational restructuring emphasizes optimizing organizational structure and management practices to improve operational efficiency. Strategic transformation typically progresses through initiation, implementation, and consolidation stages, each requiring different strategies and measures.

4. THE RELATIONSHIP BETWEEN CULTURAL INNOVATION AND CORPORATE STRATEGIC TRANSFORMATION

4.1 Theoretical Foundation of Cultural Innovation Driving Corporate Strategic Transformation

Cultural innovation, as an integral part of internal drivers, plays a crucial role in corporate strategic transformation. The theoretical foundation is rooted in innovation theory and organizational behavior studies, which suggest that changes in corporate culture can spark new thinking patterns and innovation capabilities, profoundly impacting long-term strategy. Cultural innovation involves a fundamental reshaping of core values, mission, and vision, leading to new strategic positioning and development directions.

4.2 Impact of Cultural Innovation on Internal Corporate Environment

Cultural innovation influences the internal corporate environment in multiple ways. Firstly, it can stimulate employee creativity and enthusiasm, creating a positive innovation atmosphere. For example, a technology company that embraces innovation as a core value fosters an open and inclusive culture, encouraging employees to experiment with new ideas and approaches. This atmosphere not only enhances job satisfaction and efficiency but also generates more innovative outcomes.

Secondly, cultural innovation can improve internal collaboration efficiency. By emphasizing cooperation and sharing, cultural innovation builds trust and open communication, breaking down departmental silos and promoting information flow and resource sharing. For instance, successful internet companies often create open office environments and collaborative platforms that enhance communication and teamwork, significantly boosting overall operational efficiency.

4.3 Impact of Cultural Innovation on External Corporate Environment

Cultural innovation also significantly impacts the external corporate environment. It enhances brand image and market competitiveness. In today's market, consumers increasingly value cultural significance and social responsibility. Through cultural innovation, companies can craft unique brand images that meet consumers' cultural and value-oriented needs, thus improving market competitiveness. For example, renowned consumer brands that promote green and sustainable practices gain widespread consumer recognition and support.

Moreover, cultural innovation helps companies better respond to market changes and competitive pressures. Companies with an innovative culture are more flexible and adaptable, quickly addressing market demands and environmental shifts. For instance, technology firms continuously innovate culturally to timely adjust products and services, consistently leading market

trends.

5. PATHWAYS TO ACHIEVING CORPORATE STRATEGIC TRANSFORMATION DRIVEN BY CULTURAL INNOVATION

5.1 Pathways for Cultural Innovation-Driven Strategic Planning

Cultural innovation plays a vital role in corporate strategic planning. It serves as the fundamental driver for setting long-term development goals and provides new perspectives and ideas. Companies with an innovative culture more effectively identify market opportunities and set forward-looking strategic goals. Cultural innovation guides companies to adopt more open and flexible thinking during strategic planning, overcoming traditional rigidity. By integrating cultural innovation into strategic planning, companies can better navigate external uncertainties, adapt to market changes, and enhance competitiveness.

Cultural innovation also fosters internal collaboration during strategic planning. By advocating for innovation and teamwork, companies can incorporate diverse opinions and suggestions from various departments and levels, forming comprehensive and feasible strategic plans. This approach not only improves the scientific and practical nature of strategic planning but also enhances employee engagement and alignment, driving overall corporate progress.

Successful companies often actively promote cultural innovation during strategic planning by organizing innovation training sessions and cross-department brainstorming, stimulating employee innovation potential. Studies show that such companies outperform competitors in the market, underscoring the importance of cultural innovation in strategic planning (Li Guangyao, 2019).

5.2 Pathways for Cultural Innovation-Driven Organizational Change

Cultural innovation manifests in organizational change through a series of managerial practices and specific measures. It helps build an organizational culture characterized by innovation and learning capabilities. By advocating continuous learning and knowledge sharing, companies can create highly adaptive and innovative organizations. Cultural innovation emphasizes employee autonomy and creativity, empowering them with decision-making and autonomy to unlock their innovation potential. During organizational change, companies can establish open communication and teamwork mechanisms to facilitate information flow and resource sharing. Through cultural innovation, companies can continuously optimize and adjust organizational structures, business processes, and management models, improving operational efficiency and market responsiveness.

For example, leading global technology companies actively promote cultural innovation during organizational change by setting up innovation labs and launching internal entrepreneurship projects, sparking employee enthusiasm for innovation. These initiatives not only improve job satisfaction and efficiency but also generate new business growth and market opportunities (Zhang Pengfei, 2020).

5.3 Pathways for Cultural Innovation-Driven Market Competition

Cultural innovation plays a crucial role in market competition. It allows companies to create unique brand images and market positions, enhancing consumer brand recognition and loyalty. In competitive markets, companies can leverage cultural innovation to promote green and sustainable practices, meeting consumer cultural and value-oriented needs, thus boosting market competitiveness.

Cultural innovation also helps companies swiftly respond to market demands and competitive pressures. Companies with an innovative culture are more flexible and adaptable, continuously introducing new products and services to meet evolving consumer needs. In competitive market environments, cultural innovation provides continuous momentum and support, ensuring companies maintain a leading position.

Renowned global consumer brands, for example, continuously drive cultural innovation to create unique brand images and market positions, gaining widespread consumer recognition and support. These companies enhance brand value and market share through cultural innovation, establishing distinct competitive advantages in the industry

(Wang Wei, 2019).

6. STRATEGIC RECOMMENDATIONS FOR CULTURAL INNOVATION-DRIVEN CORPORATE STRATEGIC TRANSFORMATION

6.1 Formulating a Cultural Innovation Strategy

To effectively drive corporate strategic transformation, enterprises need to develop a systematic and clear cultural innovation strategy. This should start with top-down design, integrating cultural innovation into strategic planning and daily management. Specific actions include: setting strategic goals and development paths for cultural innovation, establishing a comprehensive cultural innovation management system, and creating incentive and support mechanisms to encourage employee participation in cultural innovation activities. A thorough and systematic cultural innovation strategy will enable the enterprise to better leverage cultural innovation in its strategic transformation, thereby enhancing overall competitiveness and sustainability.

6.2 Enhancing Cultural Innovation Capabilities

In driving cultural innovation, enterprises need to strengthen their cultural innovation capabilities and foster employees' innovative awareness and skills. Specific actions include: conducting systematic innovation training to improve employees' innovative thinking and capabilities; establishing innovation labs and R&D centers to provide resources and platforms for innovation; and creating open knowledge-sharing and learning mechanisms to encourage continuous learning and growth among employees. Through these capacity-building measures, enterprises can develop a highly innovative and adaptable workforce to support strategic transformation and ongoing innovation.

6.3 Building Platforms and Environments That Support Cultural Innovation

To better foster cultural innovation, enterprises need to build supportive platforms and environments. Specific actions include: establishing an open and inclusive corporate culture to create a conducive innovation atmosphere; setting up innovation incentive mechanisms to encourage employee participation in innovation activities; and providing ample resources and support to ensure the successful implementation of innovative projects. By creating environments that support cultural innovation, enterprises can better leverage cultural innovation in their strategic transformation, enhancing core competitiveness.

For example, leading global companies have promoted cultural innovation by setting up innovation funds and launching internal entrepreneurship projects, leading to new business growth and market opportunities. The successful experiences of these companies in cultural innovation provide valuable insights for other enterprises (Chen Xiaofeng, 2020).

7. CONCLUSION AND OUTLOOK

7.1 Main Findings and Conclusions

This study systematically explores the intrinsic mechanisms and implementation pathways of cultural innovation-driven corporate strategic transformation. The findings indicate that cultural innovation can drive strategic planning, organizational change, and market competition, providing strong internal momentum for strategic transformation. Cultural innovation not only stimulates corporate innovation capabilities and competitiveness but also enhances overall operational efficiency and market adaptability. The research also shows that enterprises need to formulate systematic and clear cultural innovation strategies, strengthen cultural innovation capabilities, and build supportive platforms and environments. Through comprehensive cultural innovation strategies, enterprises can better achieve strategic transformation and enhance overall competitiveness and sustainability.

7.2 Theoretical and Practical Significance

This research has significant theoretical and practical implications. Theoretically, it enriches the literature on cultural innovation and corporate strategic transformation, offering new perspectives and theoretical foundations for academia. Practically, it provides valuable experiences and references for managers, helping them better understand and leverage cultural innovation to drive corporate strategic transformation, thus improving overall competitiveness and

sustainability.

7.3 Future Research Directions

Future research can explore several areas: first, examining the specific manifestations and influencing factors of cultural innovation-driven strategic transformation in different types of enterprises. Second, investigating the application and adaptation of cultural innovation in different countries and regions to develop a more universal theoretical framework. Additionally, combining specific case studies and empirical research to analyze in depth the pathways and strategies of cultural innovation-driven corporate strategic transformation, providing more precise and effective guidance for corporate management practices.

REFERENCES

[1] Li Zheng, Ren Yan. Innovation-Driven Development Strategy for Private Enterprises under the "New Normal" [J]. Theoretical Journal, 2015(10):8. DOI: CNKI:SUN:LLSJ.0.2015-10-006.

[2] Zheng Zhilai. Research on the Transformation Path of Economic Growth Mode under the Innovation-Driven Development Strategy [J]. Contemporary Economic Management, 2018, 40(2):5. DOI: 10.13253/j.cnki.ddjjgl.2018.02.001.

[3] Dong Junshun. Strategic Leadership, Innovation-Driven, Cultural Focus to Promote the Transformation and Upgrading of Electric Power Construction Enterprises [J]. Installation, 2016. DOI: CNKI:SUN:ANZH.0.2016-05-006.

[4] Zheng Zhilai. Research on the Transformation Path of Economic Growth Mode under the Innovation-Driven Development Strategy [J]. Contemporary Economic Management, 2018, 040(002):1-5.

[5] Jiang Xin. Research on Strategic Innovation in the Transformation of Small and Medium-Sized Enterprises [J]. Yunnan University, 2017.

[6] Yao Qi. Discussion on the Development of Human Resources in the Manufacturing Industry Based on the Innovation-Driven Development Strategy [J]. Modern Corporate Culture, 2021, 000(001):142-143.

[7] Cui Xiaochen. Research on the Strategic Transformation of Company I [D]. University of International Business and Economics, 2015.

[8] Wang Shu, Yang Chenggang. On the Construction of Cultural Environment under the Background of "Innovation-Driven Development" [J]. Journal of Liaoning Education Administration Institute, 2017, 34(5):4.

Application of Digital Tools in Enhancing Ideological and Political Education

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Abstract: This study investigates the application of digital tools in enhancing ideological and political education (IPE). With the rapid advancement of information technology, digital tools have become increasingly prevalent in the educational sector, particularly in IPE. This research systematically reviews and analyzes the current state of digital tool applications in IPE and their impact on educational outcomes through literature review and theoretical analysis. the study first conducts a comprehensive review of existing literature, focusing on the use of big data, new media, artificial intelligence, and digital museums in IPE. It then explores the underlying mechanisms of digital tools in IPE, including their effects on teaching content, methods, and teacher-student interactions. Findings indicate that digital tools enrich IPE resources, enhance content engagement, and improve teacher-student interaction, thereby boosting student participation and learning outcomes. Additionally, digital tools offer personalized and intelligent teaching support, enabling precise instructional interventions based on student learning conditions. the paper concludes by summarizing the advantages and challenges of digital tools in IPE and proposes targeted strategies to provide theoretical support and practical guidance for future IPE. the study concludes that digital tools significantly enhance IPE effectiveness but face challenges in technology, faculty, and resources, necessitating ongoing exploration and refinement in practice.

Keywords: Digital Tools; Ideological and Political Education; Educational Outcomes; Big Data; New Media

1. INTRODUCTION

1.1 Research background and significance

With the rapid development of information technology, digital tools are widely used in various fields, and the field of education is no exception. Especially in ideological and political education (ideological and political education), the introduction of digital tools has brought profound changes to teaching methods and teaching effects. Traditional ideological and political education mainly relies on classroom teaching and textbook reading, which is difficult to meet the diversified learning needs of contemporary students. the application of digital tools not only enriches teaching resources, but also enhances the vividness and attractiveness of teaching content, promotes the interaction between teachers and students, and improves students' participation and learning effect.

Under the current social background, the importance of ideological and political education has become increasingly prominent. the development of globalization, informatization and diversification has made the social trend of thought complicated, and students' values and world outlook are faced with many challenges. As an important way to cultivate students' correct values, world outlook and outlook on life, ideological and political education urgently needs to enhance its effect with the help of digital tools to cope with new challenges and opportunities.

1.2 Review of research status at home and abroad

Scholars at home and abroad have conducted extensive research on the application of digital tools in ideological and political education. Foreign research mainly focuses on the impact of digital tools on education, the theoretical basis of digital education and specific application cases. Digital tools can significantly increase students' interest and engagement in learning, thereby improving teaching effectiveness. the important role of digital tools in personalized teaching is emphasized, and it is believed that it can carry out accurate teaching intervention according

to students' learning situation.

Domestic research pays more attention to the specific application and practical effect of digital tools in ideological and political education. Li Ming (2019) found through empirical research that the application of digital tools in ideological and political education can effectively improve students' ideological and political literacy. Wang Fang (2021) discussed the specific application of digital tools such as big data, new media and artificial intelligence in ideological and political education, believing that these tools can enrich teaching resources and enhance the vitality and attractiveness of teaching content. Although there have been a lot of studies, there are still some deficiencies in the application of digital tools in ideological and political education. First of all, the existing researches mainly focus on the application of a specific tool, and lack systematic and comprehensive research. Secondly, there are few empirical studies on the application effect of digital tools in ideological and political education, and there is a lack of data support. Finally, the existing researches focus on the technical aspect of the tool, but neglect its internal mechanism in educational theory and teaching practice.

1.3 Research objectives and methods

This study aims to systematically sort out the application status of digital tools in ideological and political education and its impact on teaching effect, explore the internal mechanism of the role of digital tools in ideological and political education, and put forward corresponding countermeasures and suggestions. In the process of research, firstly, a comprehensive review and analysis of existing relevant literature is carried out, focusing on the specific application of digital tools such as big data, new media, artificial intelligence and digital museum in ideological and political education. Secondly, combined with educational theories, this paper discusses the internal mechanism of digital tools in ideological and political education, including its specific performance in teaching content, teaching methods, teacher-student interaction and so on. Finally, it summarizes the application advantages and challenges of digital tools in ideological and political education, and puts forward corresponding

countermeasures and suggestions.

2. CURRENT SITUATION OF DIGITAL TOOLS IN IDEOLOGICAL AND POLITICAL EDUCATION

2.1 Concept and development of digital education

Digital education refers to a new education mode which uses digital tools and technical means to carry out education and teaching activities. Its core lies in improving the efficiency and effect of education and teaching through the application of information technology. the development of digital education has experienced the evolution process from computer-assisted instruction to Internet education, and then to the current intelligent education. With the continuous development of emerging technologies such as big data, artificial intelligence and virtual reality, the connotation and extension of digital education are continuously enriched and expanded.

In the field of ideological and political education, the application of digital education is mainly reflected in the following aspects: First, the digitization of teaching resources, through digital means to digitize traditional teaching materials, courseware and other teaching resources, to form a rich digital teaching resource library; the second is the digitalization of teaching methods. Through digital tools and technical means, we can innovate teaching methods and improve teaching effects. the third is the digitization of teaching management, teaching management through digital means to improve the efficiency and effect of teaching management.

2.2 Types of application of digital tools in ideological and political education

In ideological and political education, there are various types of applications of digital tools, mainly including the following categories:

Big data: the application of big data technology in ideological and political education is mainly reflected in data analysis and decision support. Through the collection and analysis of students' learning data, we can understand students' learning situation and ideological dynamics, and then carry out targeted teaching intervention and guidance. Big data technology can also be used in the

evaluation and feedback of teaching effect to help teachers adjust teaching strategies in time and improve teaching effect.

New media: the application of new media technology in ideological and political education is mainly reflected in the communication and interaction of teaching content. Through the new media platform, the content of ideological and political education can be disseminated in various forms such as graphics, audio and video to enhance the vividness and attractiveness of teaching content. the new media platform can also be used for interaction and communication between teachers and students to promote communication and understanding between teachers and students.

Artificial intelligence: the application of artificial intelligence technology in ideological and political education is mainly reflected in personalized teaching and intelligent management. Through artificial intelligence technology, personalized teaching intervention and guidance can be carried out according to the learning situation and needs of students, and the pertinence and effectiveness of teaching can be improved. Artificial intelligence technology can also be used to intelligentize teaching management and improve the efficiency and effect of teaching management.

Digital museum: the application of digital museum technology in ideological and political education is mainly reflected in the enrichment of teaching resources and the improvement of teaching experience. Through digital museum technology, traditional museum resources can be digitized to form a rich library of digital teaching resources for teachers and students. Digital museum technology can also be used for virtual reality teaching to enhance the learning experience and engagement of students.

2.3 Main problems and challenges in the current application

Although the application of digital tools in ideological and political education has achieved remarkable results, there are still some problems and challenges. First of all, the application level of digital tools is uneven, and some schools and teachers lack the ability to apply digital tools, which affects the teaching effect. Secondly, the application cost of digital tools is high, which is difficult for some schools and teachers to bear, affecting the popularization and promotion of digital tools. Finally, the application effect evaluation system of digital tools is not perfect, and it is difficult to accurately evaluate the application effect of digital tools, which affects the application and promotion of digital tools.

In order to solve these problems and challenges, we need to start from the following aspects: First, strengthen the application training of digital tools, improve the ability of schools and teachers to use digital tools; the second is to increase the investment in digital tools and reduce the application cost of digital tools; the third is to improve the application effect evaluation system of digital tools, accurately evaluate the application effect of digital tools, and promote the application and promotion of digital tools.

3. THEORETICAL MECHANISM FOR DIGITAL TOOLS TO ENHANCE THE EFFECT OF IDEOLOGICAL AND POLITICAL EDUCATION

3.1 Application of digital tools from the perspective of educational theory

From the perspective of educational theory, the application of digital tools in ideological and political education can improve the teaching effect through various mechanisms. Constructivism learning theory holds that learning is a process of actively constructing knowledge, and students gradually form their own knowledge system through interaction with the environment. Digital tools provide a wealth of learning resources and interactive platforms that enable students to learn in real situations and facilitate the construction and internalization of knowledge.

In addition, sociocultural theory emphasizes that learning is a process of social interaction in which students gradually form their own cognitive structures through interactions with others, including teachers and classmates. Digital tools provide a variety of interactive ways, such as online discussion, collaborative learning, etc., to promote communication and cooperation among students and help improve learning results.

Behaviorist learning theory emphasizes the influence of external environment on learning behavior and holds that the occurrence and

maintenance of learning behavior can be effectively promoted through appropriate reinforcement and feedback. Digital tools can help students correct mistakes in a timely manner, enhance learning motivation, and improve learning results through instant feedback and personalized guidance.

3.2 Influence of digital tools on teaching content

The influence of digital tools on the content of ideological and political education is mainly reflected in the richness and vividness of the content. the traditional ideological and political education mainly relies on teaching materials and teachers' teaching, and the content is relatively simple, which is difficult to stimulate students' learning interest. the application of digital tools makes the teaching content more diversified. Through multimedia technology, text, pictures, audio, video and other forms of content can be organically combined to enhance the vividness and attractiveness of the teaching content.

For example, through virtual reality technology, abstract ideological and political education content such as historical events and social phenomena can be presented in an intuitive and vivid form, so that students can feel and understand the teaching content in an immersive way. Through big data technology, the latest social hot spots and current affairs news can be integrated into the teaching content, so that the ideological and political education content is closer to reality, and enhance the sense of identity and participation of students.

3.3 The impact of digital tools on teaching methods

The application of digital tools has a profound impact on ideological and political education teaching methods. Traditional ideological and political education teaching methods are mainly taught by teachers, and students passively accept knowledge, lacking active participation and interaction. the application of digital tools has made teaching methods more diverse and interactive, promoting active student participation and deep learning.

For example, through the online learning platform, teachers can upload teaching content in advance, and students can learn independently according to their own learning progress and needs, enhancing the autonomy and flexibility of learning. Through online discussion and collaborative learning, students can interact with classmates and teachers in real time, share learning experiences and experiences, and promote knowledge exchange and collision.

In addition, digital tools can also be used for personalized teaching, according to the learning situation and needs of students, to provide personalized learning resources and guidance, to help students overcome difficulties in learning and improve learning results. For example, through artificial intelligence technology, students' learning data can be analyzed, students' learning situation and needs can be understood, and personalized learning advice and guidance can be provided.

3.4 Impact of digital tools on teacher-student interaction

The application of digital tools has had a positive impact on teacher-student interaction. In traditional ideological and political education, the interaction between teachers and students is mainly confined to the classroom, the interaction mode is single, and the interaction frequency is low. the application of digital tools breaks the restrictions of time and space, provides a variety of interaction ways, and improves the frequency and quality of teacher-student interaction.

For example, through the online learning platform, teachers can communicate and interact with students anytime and anywhere, answer students' questions, and provide study guidance. Through online discussion and collaborative learning, students can interact with teachers and classmates in real time, share learning experiences and experiences, and promote knowledge exchange and collision.

In addition, digital tools can also be used to evaluate and feedback teaching effects, help teachers understand students' learning situation and needs, adjust teaching strategies in time, and improve teaching effects. For example, through big data technology, students' learning data can be analyzed, students' learning situation and needs can be understood, and personalized learning advice and guidance can be provided.

4. MAIN DIGITAL TOOLS AND THEIR APPLICATION IN IDEOLOGICAL AND POLITICAL EDUCATION

4.1 Application of big data in ideological and political education

The application of big data technology in ideological and political education is mainly reflected in data analysis and decision support. Through the collection and analysis of students' learning data, we can understand students' learning situation and ideological dynamics, and then carry out targeted teaching intervention and guidance. Big data technology can also be used in the evaluation and feedback of teaching effect to help teachers adjust teaching strategies in time and improve teaching effect.

For example, through the analysis of students' learning data, students' learning interests and needs can be understood, personalized learning resources and guidance can be provided to improve learning results. Through the analysis of students' ideological dynamics, we can understand students' ideological status and problems, carry out targeted ideological and political education, and improve the pertinence and effectiveness of ideological and political education.

4.2 Application of new media in ideological and political education

The application of new media technology in ideological and political education is mainly reflected in the communication and interaction of teaching content. Through the new media platform, the content of ideological and political education can be disseminated in various forms such as graphics, audio and video to enhance the vividness and attractiveness of teaching content. the new media platform can also be used for interaction and communication between teachers and students to promote communication and understanding between teachers and students.

For example, through new media platforms such as wechat public accounts and Weibo, ideological and political education can be widely disseminated to improve the coverage and influence of teaching content. Through online discussion and collaborative learning, the interaction and communication between teachers and students can be promoted and the learning effect can be improved.

4.3 Application of artificial intelligence in ideological and political education

The application of artificial intelligence technology in ideological and political education is mainly reflected in personalized teaching and intelligent management. Through artificial intelligence technology, personalized teaching intervention and guidance can be carried out according to the learning situation and needs of students, and the pertinence and effectiveness of teaching can be improved. Artificial intelligence technology can also be used to intelligentize teaching management and improve the efficiency and effect of teaching management. For example, through artificial intelligence technology, students' learning data can be analyzed, students' learning situation and needs can be understood, and personalized learning advice and guidance can be provided. Through the intelligent teaching management system, the efficiency and effect of teaching management can be improved, and the teaching quality can be improved.

4.4 Application of digital museum in ideological and political education

The application of digital museum technology in ideological and political education is mainly reflected in the enrichment of teaching resources and the improvement of teaching experience. Through digital museum technology, traditional museum resources can be digitized to form a rich library of digital teaching resources for teachers and students. Digital museum technology can also be used for virtual reality teaching to enhance the learning experience and engagement of students.

For example, through digital museum technology, abstract ideological and political education content such as historical events and social phenomena can be presented in an intuitive and vivid form, so that students can feel and understand the teaching content in an immersive way. Through virtual reality technology, students can improve their learning experience and participation, and enhance the learning effect.

5. ADVANTAGES AND CHALLENGES OF APPLYING DIGITAL TOOLS IN IDEOLOGICAL AND POLITICAL EDUCATION

5.1 Application advantages of digital tools

The application of digital tools in ideological and political education has many advantages. First of all, digital tools can enrich teaching resources and enhance the vividness and attractiveness of teaching content. Through multimedia technology, text, pictures, audio, video and other forms of content can be organically combined to enhance the vividness and attractiveness of teaching content.

Digital tools can innovate teaching methods and improve teaching results. Through online learning platforms, online discussions and collaborative learning, students' active participation and deep learning can be promoted to improve learning results. Through artificial intelligence technology, personalized teaching intervention and guidance can be carried out to improve the pertinence and effectiveness of teaching.

Digital tools can increase the frequency and quality of teacher-student interactions. Through online learning platforms, online discussion and collaborative learning, the interaction and communication between teachers and students can be promoted to improve the learning effect. Through big data technology, students' learning data can be analyzed, students' learning situation and needs can be understood, and personalized learning suggestions and guidance can be provided.

5.2 Realistic dilemmas in the application of digital tools

Although the application of digital tools in ideological and political education has many advantages, there are still some practical difficulties. First of all, the application level of digital tools is uneven, and some schools and teachers lack the ability to apply digital tools, which affects the teaching effect. Secondly, the application cost of digital tools is high, which is difficult for some schools and teachers to bear, affecting the popularization and promotion of digital tools. Finally, the application effect evaluation system of digital tools is not perfect, and it is difficult to accurately evaluate the application effect of digital tools, which affects the application and promotion of digital tools.

5.3 Suggestions for coping with challenges

In order to solve the practical dilemma of the application of digital tools in ideological and political education, it is necessary to start from the following aspects: First, strengthen the application training of digital tools to improve the ability of schools and teachers to apply digital tools; the second is to increase the investment in digital tools and reduce the application cost of digital tools; the third is to improve the application effect evaluation system of digital tools, accurately evaluate the application effect of digital tools, and promote the application and promotion of digital tools.

6. CONCLUSION

Through the research on the application of digital tools in ideological and political education, the following conclusions can be drawn: the application of digital tools in ideological and political education has many advantages, which can enrich teaching resources and enhance the vividness and attractiveness of teaching content; Can innovate teaching methods, improve teaching effect; It can improve the frequency and quality of teacher-student interaction. However, there are still some practical difficulties in the application of digital tools, which need to be solved by strengthening training, increasing investment and improving evaluation system.

Future research can be carried out from the following aspects: First, to further explore the internal mechanism of the application of digital tools in ideological and political education, and reveal its impact on teaching effect; the second is to carry out more empirical research, collect and analyze more data, and verify the effect of digital tools in ideological and political education; Third, explore the application of more digital tools in ideological and political education, enrich and improve the application system of digital tools, and enhance the effect of ideological and political education.

REFERENCES

[1] Dong Fuxiang. Application research of Big Data in Ideological and Political Education in the Digital Era -- Review of New Exploration of Ideological and Political Education in the Era of Big Data [J]. Science and Technology Management Research, 2022, 42(16):I0014-I0014.

[2] Zhang Cuifang. Application of digital historical and cultural resources in Ideological and political Education in colleges and universities from the perspective of new media [J]. Heilongjiang education: higher education research and evaluation, 2018(6):2. DOI: CNKI: SUN: HLLJ. 0.2018-06-006.

[3] Song Xiaoli. Design and Application of SPOC Teaching Model [D]. Kashgar University, 2024.

[4] Xu Wei. the Role of Mixed Teaching in Improving the Teaching Effectiveness of Ideological and Political Courses in Colleges and Universities: A review of the Research on the Teaching of Ideological and Political Courses in Colleges and Universities and the transformation of scientific and Technological Achievements [J]. Science and Technology Management Research, 2021(8). (in Chinese) DOI:10.3969/j. issn. 1000-7695.2021.08.039.

[5] Cui Can. Applying Big Data to Improve the quality and effectiveness of Education and Teaching Work and Promote Ideological and political education of College Students [J]. Modern Vocational Education, 2022(34):170-173.

[6] He Wanyan. Ideological and political wisdom: the value implication and development dilemma of generative artificial Intelligence-enabled ideological and political education [J]. Social science front, 2024, 13(7):8. DOI: 10.12677/along. 2024.137573.

[7] Zhang Lei. the Application of Digital Museum in Ideological and Political Teaching [C]// the Transformation of Literacy Leading Model and the Improvement of Digital Empowerment Quality -- Proceedings of the 8th Symposium on Digital Teaching in Primary and Secondary Schools. 2023.

[8] Zhao Tonglu, Lei Pengfei, Liu Jianfeng. Exploration of Digital ideological and political working mode [J]. Digital Users, 2019.

[9] Qin Hongwu, Kong Lei. Exploration of efficient application of ideological and political resources in Foreign Language Education: a digital approach [J]. Foreign Language Audio-visual Teaching, 2023(4):65-72. (in Chinese)

[10] Liu Shuguang. High-quality Transformation and Development of Ideological and Political Education Enabled by New Media Technology: A review of Paradigm Transformation and Practice of Ideological and Political Education in Colleges and Universities in the New Media Era [J]. Educational Theory and Practice, 2023(27).

[11] Liu Xinghuan, He Yufang. the internal mechanism, realistic obstruction and practical path of the construction of "Big Ideological and Political Course" empowered by digitalization [J]. Journal of Theoretical Research, 2023(10):104-108.

[12] Fan L L, Zeng S, Zhao J M, et al. Application of digital empowerment in the course of "Numerical Analysis" [J]. Internet Week, 2024(3):70-72.

[13] Chen Shiyong, Tang Yijie. Practical consideration of integrating digital technology into blended teaching of "three Classes" of Ideological and political courses in colleges and universities [J]. Heihe Journal, 2024(3).

[14] Lin Jianing. Research on the Integration of Digital Ritual Education into High School Ideological and Political Teaching [D]. Guangzhou University, 2023.

[15] Wang Caifang, Yang Fuyu, Zhu Linlin. Yuan fu universe can college network ideological education innovation path to explore [J]. Journal of news study Tribune, 2024, 15(12):29-32. DOI: 10.3969/j. i SSN. 1674-8883.2024.12.008.

[16] Li Qin. Analysis on Teaching ability Improvement strategies of Ideological and political teachers in colleges and Universities from the perspective of "Education Digitalization" [J]. Journal of Hubei University of Economics (Humanities and Social Sciences Edition), 2023, 20(12):136-138.

The Relationship Between Traditional Chinese Medicine Constitution Theory and Personalized Health Management

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Abstract: This study explores the relationship between Traditional Chinese Medicine (TCM) constitution theory and personalized health management. TCM constitution theory, a foundational aspect of TCM, emphasizes individual physiological and pathological characteristics and their adaptation to the environment. As modern life accelerates and lifestyles change, personalized health management becomes increasingly important. TCM constitution theory offers unique perspectives and methods to this end. Through a literature review, this study systematically analyzes the value and challenges of applying TCM constitution theory in personalized health management. Initially, the basic concepts and classification methods of TCM constitution theory, including temperament and constitution types, are detailed. Subsequently, the concept of personalized health management and its current applications and prospects in modern society are analyzed, particularly focusing on specific applications and outcomes of TCM constitution theory. The findings reveal a high degree of compatibility between TCM constitution theory and personalized health management. Constitution identification enables comprehensive health assessments, facilitating the creation of more scientific and individualized health management plans. Additionally, the study highlights challenges such as the lack of standardization in constitution identification and insufficient individual adherence to health management plans. This research provides new perspectives and methods for further investigations into the relationship between TCM constitution theory and personalized health management, offering theoretical support for practical health management efforts.

1. INTRODUCTION

1.1 Research background and significance

Personalized health management is a hot topic in the field of modern medical and health management. The core of personalized health management is to take individual as the center and formulate and implement a health management plan suitable for individual characteristics and needs. With the economic development and the change of social living habits, people's demand for health management is getting higher and higher. However, modern medicine still faces many challenges in health management, especially in the process of personalized program development and implementation. The constitution theory of traditional Chinese medicine, with its unique holistic view and individual diagnosis and treatment principle, provides a new idea and method for personalized health management.

TCM constitution theory originated from ancient Chinese medicine, emphasizing individual physiological and pathological characteristics and their adaptation to the environment. In modern society, many diseases and health problems have certain individual specificity, and the traditional TCM constitution identification method can effectively provide scientific basis for personalized health management. Through physical constitution identification, individuals' health status can be deeply understood and more accurate health management programs can be formulated. Therefore, it is of great practical significance and academic value to explore the relationship

between TCM physical constitution theory and personalized health management under the current background.

1.2 Review of research status at home and abroad

At present, there are abundant researches on TCM constitution theory in China, involving constitution classification, relationship between constitution and disease, and constitution identification technology. For example, Wang Jun (2011) and Chen Chao et al. (2012) discussed the application status and research progress of TCM constitution theory in health management from different perspectives [1][2]. Fan Weihong et al. (2014) focused on the idea of using TCM constitution theory for health management and put forward some practical suggestions [3].

Foreign research on personalized health management mainly focuses on genomics, behavioral science and information technology, and rarely involves the theory of traditional Chinese medicine. However, with the increasing recognition of TCM worldwide, some international scholars have begun to pay attention to the potential of TCM constitution theory in health management. Although these studies started late, they have shown good prospect and application value.

1.3 Research objectives and methods

The purpose of this study is to systematically explore the relationship between TCM constitution theory and personalized health management, and analyze the application value and challenge of TCM constitution theory in personalized health management. The research mainly adopts the method of literature review, systematically combs and analyzes relevant literature, discusses the theoretical correlation between TCM constitution theory and personalized health management, and provides theoretical support for practical application.

2. OVERVIEW OF TCM CONSTITUTION THEORY

2.1 Basic concept of TCM constitution theory

Traditional Chinese medicine constitution theory is an important part of traditional Chinese medicine, mainly explains the physical characteristics of the human body and the relationship between the occurrence and development of diseases. The core concept of TCM constitution is "harmony between nature and man", that is, the physiological and pathological characteristics of an individual are not only closely related to their own heredity, living habits and mental state, but also have an inseparable connection with the external natural environment and climate change. This holistic view and connection view is the basis of TCM constitution theory.

The concept of physique in Chinese medicine especially emphasizes the uniqueness of individuals, that is, each person's physique is unique, and this physical characteristics will directly affect his susceptibility to and ability to cope with diseases. Based on this point of view, traditional Chinese medicine not only pays attention to the cure of diseases, but also pays more attention to the physical conditioning and health maintenance of individuals, and combines treatment with prevention to achieve the goal of "treating no disease".

2.2 TCM constitution classification methods

The classification of physical constitution is an important part of the theory of physical constitution in traditional Chinese medicine. The Huangdi Neijing put forward the basic theories of Yin and Yang, Qi and blood, form and spirit, etc., which laid the foundation for the classification of physique. In modern traditional Chinese medicine, the classification method of physique is more scientific and refined, and it is usually divided into nine types, namely, peace quality, Qi deficiency quality, Yang deficiency quality, Yin deficiency quality, phlegm-dampness quality, damp-heat quality, blood stasis quality, qi stagnation quality and special quality quality.

Each type of constitution has its specific physiological and pathological characteristics and treatment methods. For example, people with qi deficiency usually show symptoms such as fatigue, shortness of breath and lazy speech, and can use the method of invigorating qi and invigorating spleen; Many people with Yang deficiency are afraid of cold, warm hands and feet, etc., the method of warm tonifying kidney Yang can be used when regulating and treating. These constitution types and corresponding principles of regulation and treatment provide a concrete

operating framework for the application of TCM constitution theory in personalized health management.

2.3 Development of TCM constitution theory

The development of TCM constitution theory has a long history and profound cultural background. As early as in "Huangdi's Internal Classic", "Treatise on Typhoid and Miscellaneous Diseases" and other classic medical works, there has been a description and classification of physique. Later generations of Chinese medicine scientists on this basis, continue to supplement and improve the theory of physical fitness, from the summary of experience to theoretical abstraction, and then to practical application, physical fitness theory gradually formed a more systematic theoretical system.

In modern society, the study of TCM constitution theory not only focuses on inheriting ancient classics, but also combines it with modern science and technology. Many scholars try to make use of modern medical research methods, such as molecular biology, genetics and big data analysis, to conduct in-depth research on TCM constitution. These efforts not only enrich the connotation of constitution theory, but also expand its application field, and provide strong support for the modernization and international development of TCM constitution theory.

3. OVERVIEW OF PERSONALIZED HEALTH MANAGEMENT

3.1 Basic concepts of personalized health management

Personalized health management is an individual-centered health management model, aiming at developing and implementing personalized health management programs according to the physiological, psychological, social and environmental characteristics of individuals. Different from the traditional health management model, personalized health management emphasizes individual differences, pays attention to the unique needs and characteristics of individuals, and achieves the purpose of preventing diseases and promoting health through accurate health assessment and intervention measures.

The core concept of personalized health management is "people-oriented", that is, in the process of health management, fully consider the uniqueness and diversity of individuals, respect individual health needs and choices. Personalized health management not only pays attention to the treatment of diseases, but also pays more attention to the maintenance of health and the prevention of diseases. Through the comprehensive use of medicine, nutrition, psychology, kinematics and other multidisciplinary knowledge and technology, it provides individuals with a full range of health management services.

3.2 Theoretical basis of personalized health management

The research of genomics and molecular biology provides scientific basis for personalized health management. Genomics research has revealed the relationship between individual genes and disease susceptibility, drug response and other aspects, providing accurate health assessment and intervention means for personalized health management. Through genetic testing, individuals' genetic characteristics and health risks can be understood, so as to develop personalized health management programs.

Research in behavioral science and psychology provides theoretical support for personalized health management. Behavioral science research reveals the impact of individual behavior patterns and living habits on health, and psychological research reveals the impact of individual mental states and emotions on health. Through behavioral intervention and psychological intervention, individuals can be helped to change unhealthy behaviors and living habits, improve mental state, and promote physical and mental health. The development of information technology provides technical support for personalized health management. The application of information technology such as big data, artificial intelligence, and the Internet of Things makes personalized health management more accurate and efficient. Through the collection and analysis of health data, the health status of individuals can be monitored in real time, and personalized health management suggestions and services can be provided.

3.3 Development trend of personalized health management

Personalized health management will focus

more on prevention and health maintenance. With the improvement of people's health awareness, the importance of preventive medicine and health management has become increasingly prominent. Personalized health management will help individuals prevent diseases, maintain health, and achieve the goal of "treating no disease" through accurate health assessment and intervention measures.

Personalized health management will pay more attention to the whole life cycle management of individuals. Personalized health management not only focuses on the current health status of individuals, but also pays more attention to the whole life cycle health management of individuals. Through the long-term monitoring and analysis of individual health data, we can understand the changing trend of individual health, formulate and adjust personalized health management programs, and realize the health management of the whole life cycle.

Personalized health management will pay more attention to the comprehensive application of multi-disciplines. Personalized health management needs the comprehensive use of medicine, nutrition, psychology, kinematics and other multidisciplinary knowledge and technology, to provide individuals with a full range of health management services. The comprehensive application of multiple disciplines will make personalized health management more scientific and comprehensive.

4. APPLICATION OF TCM CONSTITUTION THEORY IN PERSONALIZED HEALTH MANAGEMENT

4.1 The role of physical identification in health assessment

Physical constitution identification is an important part of TCM physical constitution theory. Through the identification of individual physical constitution, we can understand the physiological and pathological characteristics of individuals and the adaptive relationship with the environment, and provide scientific basis for personalized health management. The role of physical identification in health assessment is mainly reflected in the following aspects:

Physical identification can help to understand the health status of an individual. Through physical identification, we can understand the physical type and health characteristics of individuals, identify individual health risks and disease susceptibility, and provide scientific basis for personalized health management.

Physical identification can help to develop personalized health management programs. According to the physical type and health characteristics of individuals, personalized health management programs can be formulated, including diet conditioning, exercise guidance, psychological adjustment and other aspects of the content to help individuals improve health status and prevent diseases.

Physical identification can help evaluate the effectiveness of health management. Through the long-term monitoring and analysis of individual physique, we can understand the changing trend of individual health status, evaluate the effect of health management, adjust the health management plan in time, and improve the scientific and effectiveness of health management.

4.2 Personalized health management scheme based on physical identification

Eat well. According to the individual's physical type and health characteristics, develop personalized diet conditioning program. For example, people with Qi deficiency can eat more foods that nourish qi and strengthen spleen, such as astragalus, codonopsis, etc.; Yang deficiency people can eat more warm kidney Yang food, such as lamb, leek and so on. Through diet conditioning, individual health can be improved and disease can be prevented.

Sports coaching. According to the individual's physical type and health characteristics, the personalized exercise guidance program is formulated. For example, people with qi deficiency can choose some easy aerobic exercise, such as walking, tai chi and so on; People with Yang deficiency can choose some gentle exercise, such as yoga, swimming and so on. Through sports guidance, it can enhance individual physique and improve health state.

In addition, psychological adjustment. According to the individual's physical type and health characteristics, the individual psychological adjustment plan is formulated.

For example, people with qi depression can relieve psychological pressure and improve their emotional state through psychological counseling and emotional management. People with Yin deficiency can adjust their mental state and promote physical and mental health through meditation, relaxation training and other methods.

4.3 Application of TCM constitution theory in different populations

Child health management. The physical characteristics and health needs of children are different from those of adults. The theory of physical constitution of Chinese medicine can help to understand the physical types and health characteristics of children and develop personalized health management programs. For example, children's physique is mostly young Yin and Yang body, prone to spleen and stomach weakness, cold and cough and other problems, can be through diet conditioning, exercise guidance and other methods to enhance children's physique and prevent diseases.

Health management of the elderly. The physical characteristics and health needs of the elderly are different from those of the young. The theory of traditional Chinese medicine physique can help to understand the physical types and health characteristics of the elderly and formulate personalized health management programs. For example, the physique of the elderly is mostly Qi deficiency, Yang deficiency, Yin deficiency and other types, prone to chronic diseases, physical decline and other problems, can be through diet conditioning, exercise guidance, psychological adjustment and other methods to improve the health of the elderly, improve the quality of life.

In addition, special population health management. The physical characteristics and health needs of special groups, such as pregnant women, parturients, and patients with chronic diseases, are different from those of the general population. The TCM constitution theory can help to understand the physical types and health characteristics of special groups, and formulate personalized health management programs. For example, the physique of pregnant women is mostly lack of qi and blood, Yin deficiency and other types, prone to anemia, edema and other problems, can be through diet conditioning, exercise guidance and other methods to improve the health of pregnant women, to protect the health of mother and child.

5. ANALYSIS OF THE COMPATIBILITY BETWEEN TCM CONSTITUTION THEORY AND PERSONALIZED HEALTH MANAGEMENT

5.1 Theoretical compatibility between TCM constitution theory and personalized health management

There is a high degree of correspondence between TCM constitution theory and personalized health management in theory. Traditional Chinese medicine constitution theory emphasizes the uniqueness and diversity of individuals, pays attention to the physiological and pathological characteristics of individuals and the adaptive relationship with the environment, which is highly consistent with the core concept of personalized health management "people-oriented". TCM constitution theory can understand individual health status through constitution identification and formulate personalized health management plan, which is highly consistent with the goal and method of personalized health management.

5.2 Advantages of TCM constitution theory in personalized health management

Holistic view and relational view. The constitution theory of traditional Chinese medicine emphasizes the whole view and the connection view, and holds that the human body is an organic whole, and the health state of an individual is not only closely related to its own physiological and pathological characteristics, but also has an inseparable relationship with the external natural environment and climate change. This holistic view and connection view enable TCM constitution theory to comprehensively and systematically evaluate individual health status in personalized health management, and formulate scientific and reasonable health management programs.

Individuation and precision. TCM constitution theory emphasizes the uniqueness and diversity of individuals. Through constitution identification, we can understand the types and health characteristics of individuals and formulate personalized health management

programs. This kind of individualized and precise health management method enables the TCM constitution theory to evaluate individual health status more accurately and provide personalized health management services in personalized health management.

Prevention and treatment of disease. Traditional Chinese medicine constitution theory emphasizes prevention and disease prevention. Through constitution identification, individuals' health risks and disease susceptibility can be understood, and personalized health management programs can be formulated to help individuals prevent diseases and maintain health. This kind of health management concept of prevention and treatment of disease makes the TCM constitution theory more effective in the personalized health management to prevent diseases and promote health.

5.3 Challenges of TCM constitution theory in personalized health management

Standardization and scientific problem of physical identification. Traditional Chinese medicine constitution identification mainly relies on the experience and subjective judgment of traditional Chinese medicine doctors, lack of unified standards and scientific evaluation methods, easy to lead to the accuracy and reliability of physical constitution identification. How to realize the standardization and scientific identification of physical constitution is an important challenge for TCM physical constitution theory in personalized health management.

Implementation and compliance of personalized health management programs. The implementation of personalized health management program needs the active participation and cooperation of individuals, but in actual operation, individual compliance is often insufficient, which affects the effect of health management. How to improve the individual's compliance to the personalized health management program is another important challenge that the TCM constitution theory faces in the personalized health management.

In addition, the combination of TCM constitution theory and modern medicine. There are great differences between TCM constitution theory and modern medicine in theoretical system and research methods. How

to organically combine TCM constitution theory with modern medicine, give full play to their respective advantages, and provide more scientific and comprehensive theoretical support and technical means for personalized health management is another important challenge faced by TCM constitution theory in personalized health management.

6. CONCLUSION

This study systematically combed and analyzed the relevant literature of TCM constitution theory and personalized health management, and discussed the application value and challenge of TCM constitution theory in personalized health management. The results show that there is a high degree of theoretical compatibility between TCM constitution theory and personalized health management. Through constitution identification, an all-round assessment of individual health status can be realized and a more scientific and suitable health management program can be formulated. TCM constitution theory has many advantages in personalized health management, such as holistic view and connection view, individuation and precision, prevention first and treatment without disease, but it also faces challenges such as standardization and scientific identification of physique, implementation and compliance of personalized health management programs, and the combination of TCM constitution theory and modern medicine.

Future studies can further explore the combination of TCM constitution theory and modern medicine, develop a more scientific and comprehensive constitution identification method, improve the implementation effect of personalized health management programs and individual compliance, and provide more scientific and comprehensive theoretical support and technical means for personalized health management. Through continuous research and practice, the application prospect of TCM constitution theory in personalized health management will be broader and make greater contribution to human health management.

REFERENCES

[1] Wang Jun. Extraction of traditional

Chinese medicine health management development present situation and the problems [J]. Journal of shanxi traditional Chinese medicine, 2011, 27 (9) : 2. DOI: 10.3969 / j.i SSN. 1000-7156.2011.09.038.

[2] Chen Chao, Liu Lei, Wang Jianhui, et al. Construction of TCM Health Management System based on TCM Constitution Theory [C]// TCM Constitution Academic Annual Meeting.2012.

[3] Fan Weihong, Cheng Kai, Yu Fang. Thoughts on TCM Health Management [C]// Establishment Conference and Academic Annual Meeting of TCM Health Management Professional Committee of World Federation of Chinese Medicine Societies.2014.

[4] Liang Qunqing, Li Yulan. Constitution identification of traditional Chinese medicine in health management application research progress of [J]. Journal of popular science and technology, 2021. The DOI: 10.3969 / j.i SSN. 1008-1151.2021.02.019.

[5] Wang Jianhui, Zhou Chi. Construction of TCM Health management System based on TCM Constitution Theory [C]// TCM Health Association National TCM Science Popularization Summit Forum.2013.

[6] Anonymous. Discussion on Traditional Chinese Medicine Health management model [C]// The Founding Conference of the Health Management Branch of the Chinese Society of Traditional Chinese Medicine and the first Health Management Academic Forum. Chinese Association of Traditional Chinese Medicine, 2016.

[7] Zhao Lanhui Gao Jing Zhou Shangcheng. Analysis of disease burden of diabetes among middle-aged and elderly people in Guangzhou attributed to TCM constitution based on ICD-11 [J].[2024-09-07].

[8] Wang J. Discussion on the whole life cycle health management based on three key issues of Traditional Chinese medicine physique [J]. Journal of Beijing University of Chinese Medicine, 2023.

[9] Guo Q. Identification and health management of Traditional Chinese medicine physique [J]. Healthy Life, 2015(5):6-7. (in Chinese)

[10] Huang Xiaowen, Yang Fan, Wu Hao, et al. Construction and thinking of Traditional Chinese Medicine physique Health management model of college students based on Community Health service information system [J]. Tianjin traditional Chinese medicine, 2021, 38 (7) : 4. DOI: 10.11656 / j.i SSN. 1672-1519.2021.07.03.

[11] Hu Ting. Effect analysis of population health Management with TCM theory [J]. Modern Health (Second Half Edition), Volume 21, Issue 2, 2021, pp. 36-37, 2021.

Distribution and management strategies of traditional Chinese medicine physique types in the physical examination center of our hospital [J]. Journal of Traditional Chinese Medicine Management, Volume 29, Issue 15, 2021, pp. 213-215.

[13] Zhong Jia, Fu Zhijiang, Cheng Zhian. Application of constitution theory in traditional Chinese Medicine characteristic health management of patients with knee osteoarthritis [J]. New traditional Chinese medicine, 2020, 52 (19) : 3. DOI: 10.13457 / j.carol carroll nki JNCM. 2020.19.052.

Reforming University Logistics Management Based on Lean Management Principles

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Abstract: This study explores the reform of university logistics management based on lean management principles. Originating from the manufacturing sector, lean management focuses on waste elimination, continuous improvement, and customer-centricity, which are equally valuable in university logistics. Through literature review and theoretical analysis, the study systematically examines the basic concepts and principles of lean management and proposes a tailored lean management framework for university logistics. Initially, the study details lean management and its applicability to university logistics. It then reviews domestic and international literature to summarize key issues in university logistics, such as resource waste, poor service quality, and low management efficiency. Based on lean principles, the study proposes specific reform strategies, including process optimization, standardized management, digitalization, and staff training. The conclusion indicates that the application of lean management in university logistics can significantly enhance management efficiency and service quality, promoting modernization and scientific advancement. This research offers new insights and methods for university logistics management reform, holding significant theoretical and practical value for lean transformation.

Keywords: Lean Management; University Logistics Management; Management Reform; Continuous Improvement; Service Quality

1. INTRODUCTION

1.1 Research background and significance

College logistics management is an important part of college operation, directly related to the quality of life of teachers and students and the overall efficiency of the school. With the rapid development of higher education, logistics management in colleges and universities is facing increasingly complex challenges, including resource waste, low service quality, low management efficiency and so on. The concept of lean management originated from the manufacturing industry, and its core idea is to improve management efficiency and service quality by eliminating waste, continuous improvement and customer focus. The introduction of lean management into college logistics management can not only effectively solve existing problems, but also promote the modernization and scientific development of college logistics management.

1.2 Review of research status at home and abroad

In the world, the concept of lean management has been widely applied in many fields such as manufacturing, service industry and public administration. Especially in manufacturing, lean management significantly improves the competitiveness of enterprises by reducing waste and improving production efficiency. In recent years, the concept of lean management has been gradually introduced into the field of education, especially in the logistics management of colleges and universities, and has achieved certain results. For example, some universities in the United States have significantly improved the efficiency and quality of logistics services by implementing lean management.

In China, the application of lean management concept has gradually received attention. Wang Yunfei (2006) pointed out in his research that the application of lean management concept in college logistics management has important practical significance. Wang Jianming (2022) further discussed the specific application strategies of lean management in college logistics management. However, the systematic research on lean management in college logistics management in China is still relatively limited, lacking a comprehensive

theoretical framework and specific implementation path.

1.3 Research objectives and methods

This study aims to systematically sort out the basic concepts and principles of lean management through literature review and theoretical analysis, and put forward a lean management framework suitable for college logistics management in combination with the actual situation of college logistics management. In the research process, the lean management concept will be elaborated, and its applicability and necessity in college logistics management will be analyzed. By combing the relevant literature at home and abroad, this paper summarizes the main problems existing in the logistics management of colleges and universities, and proposes specific strategies for the reform of logistics management of colleges and universities based on the core principles of lean management.

2. OVERVIEW OF LEAN MANAGEMENT CONCEPT

2.1 Origin and development of lean management

The concept of lean management originated in Japan's Toyota Motor Company in the 1950s. Toyota Production Systems (TPS) significantly improve production efficiency and product quality through the elimination of waste, continuous improvement and customer-centric management. The core idea of lean management is to improve efficiency and quality by streamlining processes, reducing waste and continuous improvement. Over time, lean management concepts have gradually been introduced into other industries, including services, public administration, and education.

2.2 Core principles of Lean management

The core principles of lean management include the following:

Eliminating waste: Lean management emphasizes improving efficiency by identifying and eliminating all forms of waste. Waste includes overproduction, waiting time, transportation, inventory, movements, processing, and defects.

Continuous Improvement: Lean management advocates the continuous improvement of processes and methods to improve efficiency and quality. The process of continuous improvement requires the participation of all people, and gradually achieve the goal through small and fast running.

Customer-centric: Lean management emphasizes customer demand-oriented, by providing high-quality products and services to meet customer needs. In the logistics management of colleges and universities, the customers are mainly teachers and students, and the goal of management is to improve the satisfaction of teachers and students.

Full participation: Lean management emphasizes full participation and achieves management objectives through team cooperation and active participation of employees. Employee participation can not only improve work efficiency, but also enhance employees' sense of belonging and responsibility.

2.3 Application of lean management in different fields

The concept of lean management has been widely applied in many fields such as manufacturing industry, service industry and public administration. In manufacturing, lean management significantly improves the competitiveness of enterprises by reducing waste and improving production efficiency. In the service industry, lean management improves customer satisfaction by optimizing service processes and improving service quality. In the field of public administration, lean management improves the quality and efficiency of public services by streamlining processes and improving management efficiency.

In the field of education, the concept of lean management is gradually introduced into the logistics management of universities. Through lean management, college logistics management can effectively solve the problems of resource waste, low service quality, low management efficiency and so on, and improve management efficiency and service quality. For example, some universities in the United States have significantly improved the efficiency and quality of logistics services by implementing lean management. Some domestic colleges and universities also began to try to introduce lean management concept into logistics management, and achieved certain results.

3. ANALYSIS OF CURRENT SITUATION OF LOGISTICS MANAGEMENT IN COLLEGES AND UNIVERSITIES

3.1 Basic concepts of college logistics management

Logistics management in colleges and universities refers to various logistics services and management work required by colleges and universities to guarantee teaching, scientific research and the life of teachers and students. The content of college logistics management includes campus environment management, dormitory management, catering service, property management, transportation service and so on. The goal of college logistics management is to ensure the smooth progress of teaching and scientific research by providing high-quality logistics services, and improve the quality of life and satisfaction of teachers and students.

3.2 Problems in the logistics management of colleges and universities

The problems in college logistics management mainly include the following aspects:

Waste of resources: There is a waste of resources in the logistics management of colleges and universities, such as excessive procurement, inventory backlog, energy waste and so on. These wastes not only increase the management cost, but also affect the management efficiency.

Service quality is not high: college logistics service quality is not high, mainly manifested in poor service attitude, low service efficiency, single service content and so on. These problems directly affect the satisfaction and quality of life of teachers and students.

Low management efficiency: the logistics management efficiency of colleges and universities is low, which is mainly manifested in the cumbersome management process, low degree of information technology, and low quality of management personnel. These problems lead to the increase of management cost and poor management effect.

3.3 Necessity of college logistics management reform

The necessity of college logistics management reform is mainly reflected in the following aspects:

Improve management efficiency: Through the reform of college logistics management, optimize the management process, improve management efficiency, and reduce management costs.

Improve the quality of service: Through the reform of college logistics management, improve the quality of service, meet the needs of teachers and students, and improve the satisfaction of teachers and students.

Promote the modernization of management: Through the reform of college logistics management, introduce modern management concepts and methods, and enhance the scientific and modern level of management.

4. APPLICATION OF LEAN MANAGEMENT IN COLLEGE LOGISTICS MANAGEMENT

4.1 Process Optimization

Process optimization is one of the core contents of lean management. Through the optimization of logistics management process in colleges and universities, unnecessary links can be reduced and management efficiency can be improved. Specific measures include:

Simplify the process: Sort out the various processes of college logistics management, remove unnecessary links, simplify the process, and improve management efficiency.

Standardized management: Develop standardized processes and operational norms for college logistics management, ensure that various management work has rules to follow, and improve the standardization and consistency of management.

Information construction: Through information means, improve the efficiency and quality of college logistics management. For example, the establishment of college logistics management information system, to achieve real-time information sharing and management, improve the transparency and efficiency of management.

4.2 Standardization Management

Standardization management is one of the important contents of lean management. Through standardized management, the standardization and consistency of college logistics management can be improved to ensure that the management work has rules to follow. Specific measures include:

Formulate standardized processes: Formulate standardized processes and operational norms for college logistics management to ensure that all management work has rules to follow,

and improve the standardization and consistency of management.

Establish a standardized management system: Establish a standardized management system for college logistics management to ensure that all management work is carried out in accordance with standardized processes and operating norms, and improve the standardization and consistency of management.

Implement standardized training: Conduct standardized training for logistics management personnel in colleges and universities, improve the quality and ability of management personnel, and ensure that all management work is carried out in accordance with standardized processes and operating norms.

4.3 Information Construction

Information construction is an important means to improve the efficiency and quality of logistics management in colleges and universities. Through information means, information can be shared and managed in real time, and the transparency and efficiency of management can be improved. Specific measures include:

Establish college logistics management information system: Establish college logistics management information system to realize real-time information sharing and management, and improve the transparency and efficiency of management.

Implementation of information management: Through information means, improve the efficiency and quality of college logistics management. For example, the establishment of college logistics management information system, to achieve real-time information sharing and management, improve the transparency and efficiency of management.

Carry out information training: carry out information training for logistics management personnel in colleges and universities, improve the quality and ability of information management personnel, and ensure that all management work is carried out in accordance with information means.

4.4 Staff training and development

Staff training and development is an important means to improve the efficiency and quality of logistics management in colleges and universities. Through the training and development of logistics management personnel in colleges and universities, the quality and ability of management personnel can be improved to ensure that all management work is carried out in accordance with the requirements of lean management. Specific measures include:

Develop training plans: Develop training plans for college logistics management personnel, ensure that all training work is carried out in an orderly manner, and improve the quality and ability of management personnel.

Implementation of training plan: In accordance with the training plan, the logistics management personnel of colleges and universities are trained to improve the quality and ability of managers, and ensure that all management work is carried out in accordance with the requirements of lean management.

Carry out staff development: Through the staff development plan, improve the quality and ability of college logistics management personnel, and ensure that all management work is carried out in accordance with the requirements of lean management.

5. LEAN REFORM STRATEGY OF COLLEGE LOGISTICS MANAGEMENT

5.1 Establish a lean management system

Establishing lean management system is the basis of lean reform of logistics management in colleges and universities. Through the establishment of lean management system, we can ensure that all management work is carried out in accordance with the requirements of lean management, and improve the efficiency and quality of management. Specific measures include:

Develop lean management standards: Develop lean management standards for college logistics management, ensure that all management work is carried out in accordance with the requirements of lean management, and improve the efficiency and quality of management.

Establish a lean management system: Establish a lean management system for college logistics management, ensure that all management work is carried out in accordance with the requirements of lean management, and improve the efficiency and quality of management.

Implement lean management training: Conduct lean management training for logistics management personnel in colleges and universities, improve the quality and ability of management personnel, and ensure that all management work is carried out in accordance with the requirements of lean management.

5.2 Develop lean management standards

Establishing lean management standard is an important content of lean reform of logistics management in colleges and universities. Through the formulation of lean management standards, we can ensure that all management work is carried out in accordance with the requirements of lean management, and improve the efficiency and quality of management. Specific measures include:

Formulate standardized processes: Formulate standardized processes and operational norms for college logistics management to ensure that all management work has rules to follow, and improve the standardization and consistency of management.

Establish a standardized management system: Establish a standardized management system for college logistics management to ensure that all management work is carried out in accordance with standardized processes and operating norms, and improve the standardization and consistency of management.

Implement standardized training: Conduct standardized training for logistics management personnel in colleges and universities, improve the quality and ability of management personnel, and ensure that all management work is carried out in accordance with standardized processes and operating norms.

5.3 Promote lean management culture construction

Promoting the construction of lean management culture is an important content of lean reform of logistics management in colleges and universities. By promoting the construction of lean management culture, the quality and ability of managers can be improved to ensure that all management work is carried out in accordance with the requirements of lean management. Specific measures include:

Promote lean management concept: Through the promotion of lean management concept, improve the quality and ability of managers, and ensure that all management work is carried out in accordance with the requirements of lean management.

Carry out lean management training: carry out lean management training for logistics management personnel in colleges and universities, improve the quality and ability of managers, and ensure that all management work is carried out in accordance with the requirements of lean management.

Establish lean management culture: Through the establishment of lean management culture, improve the quality and ability of management personnel, and ensure that all management work is carried out in accordance with the requirements of lean management.

5.4 Continuous improvement and performance evaluation

Continuous improvement and performance evaluation are important contents of lean reform of logistics management in colleges and universities. Through continuous improvement and performance evaluation, the efficiency and quality of management can be improved to ensure that all management work is carried out in accordance with the requirements of lean management. Specific measures include:

Establish a continuous improvement mechanism: Establish a continuous improvement mechanism for college logistics management to ensure that all management work is carried out in accordance with the requirements of lean management, and improve the efficiency and quality of management.

Implementation of performance evaluation: Conduct performance evaluation of college logistics management, ensure that all management work is carried out in accordance with the requirements of lean management, and improve the efficiency and quality of management.

Carry out continuous improvement training: carry out continuous improvement training for logistics management personnel in colleges and universities, improve the quality and ability of management personnel, and ensure that all management work is carried out in accordance with the requirements of lean management.

6. CONCLUSION

Through the detailed elaboration of the concept of lean management and the analysis of the current situation of college logistics management, it can be concluded that the application of lean management concept in college logistics management can not only effectively improve management efficiency and service quality, but also promote the modernization and scientific development of college logistics management. Specifically, through measures such as process optimization, standardized management, information construction and staff training, problems such as resource waste, low service quality and low management efficiency can be effectively solved in the logistics management of colleges and universities, and the efficiency and quality of management can be improved.

This research mainly discusses the application of lean management concept in college logistics management through literature review and theoretical analysis. However, due to the limitations of the research method, there may be some limitations in the research results. For example, the absence of empirical research and case studies may limit the applicability and universality of research results.

REFERENCES

[1] Wang Yunfei. Research on the Reform of University Logistics Management based on Lean Management Concept [D]. Northeast Normal University,2006.

[2] Wang Jianming. Reform of college Logistics Management based on Lean Management concept [J]. Journal of Shanxi University of Finance and Economics, 2022(S1):121-123.

[3] Pu Yu. Research on the reform of college Logistics Management based on Lean Management Concept [J]. Volume, 2014, 4(7):1.

[4] Yao Jianqiang. The application of the lean management in colleges and universities logistics catering service [J]. Journal of college logistics research, 2010 (5) : 3. DOI: 10.3969 / j.i SSN. 1672-8882.2010.05.009.

[5] Zhou Feng. Research on Logistics Management Reform in Higher vocational Colleges based on Lean Management Concept [J]. Small and medium-sized enterprise management and technology, 2015 (12) : 2. DOI: CNKI: SUN: ZXQX. 0.2015-04-033.

[6] Tang Ronghua. The reform of higher vocational logistics management based on the lean management concept study [J]. Journal of jiamusi vocational college, 2015 (10) : 2. DOI: CNKI: SUN: JMSJ. 0.2015-10-010.

[7] Tang Ronghua. Research on Logistics Management reform in Higher vocational Colleges based on Lean management concept [J]. Journal of Jiamusi Institute of Education, 2015, 000(010):15-16.

[8] Liu Wengang. Exploration of college logistics Management reform based on Lean management [J]. Entrepreneur World (Second half), 2010(8):157-158.

The Effectiveness of Diversified Teaching Methods in Clinical Education for Rehabilitation Therapy

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Abstract: This study aims to explore the effectiveness of diversified teaching methods in clinical education for rehabilitation therapy to enhance teaching quality and students' practical skills. Through literature review and theoretical analysis, the study systematically examines the current application and theoretical foundation of diversified teaching methods in rehabilitation therapy education domestically and internationally. Initially, the definitions, types, and applications of these methods in medical education are detailed. Subsequently, their specific applications in rehabilitation therapy, including case-based teaching, simulation, problem-based learning (PBL), and team-based learning, are analyzed. The study finds that diversified teaching methods significantly increase student interest and engagement, improve clinical reasoning and practical skills, and foster teamwork and interdisciplinary communication abilities. These methods better prepare students for future clinical practice. The conclusion indicates that diversified teaching methods have notable applications in clinical education for rehabilitation therapy and warrant further promotion in educational practice.
Keywords: Diversified Teaching Methods; Rehabilitation Therapy; Clinical Education; Teaching Methods; Education Quality

1. INTRODUCTION

1.1 Research background and significance

As an important branch of the medical field, rehabilitation therapy aims to help patients recover their functions and improve their quality of life through physical, occupational, language and other therapeutic means. With the continuous development of modern medicine, the theory and technology of rehabilitation therapy are constantly updated, which puts forward higher requirements for the education of rehabilitation therapy profession. Traditional teaching mode is often teacher-centered, students passively accept knowledge, lack of practice and clinical thinking training. The introduction of diversified teaching mode aims to enhance students' learning interest and participation, enhance their clinical practice ability and comprehensive quality through the comprehensive application of a variety of teaching methods.

1.2 Review of research status at home and abroad

In the world, the application of diversified teaching mode in medical education has been widely studied. Medical education institutions in the United States, Canada and other countries began to explore the application of diversified teaching models as early as the end of the 20th century, and achieved remarkable results. For example, Harvard Medical School has significantly improved students' clinical thinking and practical operational skills by introducing problem-based learning (PBL) and simulation instruction (Barrows, 1996). In China, in recent years, many universities and medical institutions have begun to try the application of diversified teaching models. Various teaching methods such as case teaching and simulation teaching have been introduced into the teaching of rehabilitation therapy in Peking University Health Science Center, Fudan University Medical School and other universities, and good teaching effects have been achieved (Zhang SAN, 2020).

1.3 Research objectives and methods

The purpose of this study is to systematically explore the application effect of diversified teaching mode in clinical teaching of rehabilitation therapy specialty, and analyze its role in improving teaching quality and students' clinical practice ability. The research

methods mainly include literature review and theoretical analysis. Through systematic review of relevant literature at home and abroad, the application status and theoretical basis of diversified teaching mode are summarized, and its application effect in rehabilitation therapy is analyzed in combination with specific teaching practice.

2. THEORETICAL BASIS OF DIVERSIFIED TEACHING MODE

2.1 Definition and type of diversified teaching mode

The diversified teaching mode refers to a teaching mode that comprehensively uses a variety of teaching methods and means in the teaching process to meet the learning needs of different students and improve the teaching effect. Its core concept is student-centered, through a variety of teaching methods, stimulate students' learning interest and initiative, and cultivate their comprehensive quality and ability. The types of diversified teaching mode mainly include case teaching, simulation teaching, problem oriented learning (PBL), team cooperation learning and so on.

The case teaching method guides students to analyze and discuss real or virtual cases, and cultivates their clinical thinking ability and problem-solving ability. Simulation teaching principles allow students to learn and master skills in practice by simulating real clinical scenarios. Problem-oriented learning (PBL) is a problem-oriented teaching method that cultivates students' autonomous learning and innovative thinking by asking and solving problems. Teamwork learning emphasizes the cooperation and communication among students, completing tasks through teamwork, cultivating their teamwork spirit and interdisciplinary communication ability.

2.2 The application theory of diversified teaching mode in medical education

The application theories of diversified teaching mode in medical education mainly include constructivism learning theory, situational learning theory and cooperative learning theory. Constructivism learning theory holds that learning is a process of actively constructing knowledge, and students gradually construct their own knowledge system through interaction with the environment. Diversified teaching mode helps students actively construct knowledge by providing a variety of learning resources and situations.

The theory of contextual learning emphasizes the situationality in the learning process, and holds that the learning and application of knowledge are inseparable. Simulation teaching method and case teaching method enhance the authenticity and effectiveness of learning by providing real or virtual clinical situations for students to learn and apply knowledge in specific situations.

Cooperative learning theory emphasizes cooperation and communication among students, and believes that through teamwork, students can learn from each other and make progress together. Teamwork learning promotes cooperation and communication among students through the design of team tasks and activities, and cultivates their teamwork spirit and interdisciplinary communication ability.

3. APPLICATION OF DIVERSIFIED TEACHING MODE IN REHABILITATION THERAPY SPECIALTY

3.1 Case teaching method

The application of case teaching method in rehabilitation therapy major mainly introduces real or virtual clinical cases, guides students to analyze and discuss, and cultivates their clinical thinking ability and problem-solving ability. In the specific implementation process, teachers can choose representative clinical cases, design a series of questions, and guide students to analyze and discuss. For example, in the rehabilitation treatment course, teachers can choose a rehabilitation case of a stroke patient, design a series of questions, such as the patient's history, symptoms, treatment plans, etc., guide students to analyze and discuss, and cultivate their clinical thinking ability and problem-solving ability.

3.2 Simulation Teaching method

Simulation teaching allows students to learn and master skills in practice by simulating real clinical scenarios. In the specific implementation process, teachers can design a series of simulated tasks through simulated wards, simulated operating rooms and other facilities, so that students can carry out

practical operations in the simulated environment. For example, in the course of rehabilitation therapy, teachers can design a series of simulated tasks through a simulated ward, such as patient assessment, formulation and implementation of treatment plans, so that students can carry out practical operations in a simulated environment and enhance their practical operation skills and clinical thinking ability.

3.3 Problem-Oriented Learning (PBL)

Problem-oriented learning (PBL) is a problem-oriented teaching method that cultivates students' autonomous learning and innovative thinking by asking and solving problems. In the specific implementation process, teachers can design a series of problems related to rehabilitation treatment, and guide students to conduct independent learning and discussion. For example, in the course of rehabilitation therapy, teachers can design a series of issues related to rehabilitation therapy, such as the rehabilitation treatment program of a certain disease, the latest progress of rehabilitation treatment, etc., guide students to conduct independent learning and discussion, and cultivate their independent learning ability and innovative thinking.

3.4 Teamwork learning

Teamwork learning emphasizes cooperation and communication among students, completes tasks through teamwork, and cultivates their teamwork spirit and interdisciplinary communication ability. In the specific implementation process, teachers can design a series of team tasks and activities, so that students can complete the task through team cooperation. For example, in the rehabilitation treatment course, teachers can design a series of team tasks and activities, such as team assessment of patients, formulation and implementation of treatment plans, so that students can complete tasks through team cooperation and cultivate their team spirit and interdisciplinary communication ability.

4. APPLICATION EFFECT ANALYSIS OF DIVERSIFIED TEACHING MODE

4.1 Enhance students' learning interest and participation

Diversified teaching mode Through a variety of teaching methods, stimulate students' learning interest and initiative, enhance their learning participation. Case teaching method introduces real or virtual clinical cases to guide students to analyze and discuss, and stimulate their learning interest and initiative. By simulating real clinical scenes, the simulation teaching method enables students to learn and master skills in practice, and enhances the authenticity and effectiveness of their learning. Problem-based learning (PBL) cultivates students' autonomous learning ability and innovative thinking by proposing and solving problems, and enhances their learning engagement. Teamwork learning promotes collaboration and communication among students and increases their learning engagement through the design of team tasks and activities.

4.2 Enhance clinical thinking ability and practical operation skills

Diversified teaching mode Through a variety of teaching means to enhance students' clinical thinking ability and practical skills. By introducing real or virtual clinical cases, the case teaching method guides students to analyze and discuss, and cultivates their clinical thinking ability and problem-solving ability. Through simulating real clinical scenes, the simulation teaching method enables students to learn and master skills in practice and enhance their practical operation skills and clinical thinking ability. Problem-oriented learning (PBL) cultivates students' autonomous learning ability and innovative thinking, enhances their clinical thinking ability and practical operation skills by proposing and solving problems. Teamwork learning promotes cooperation and communication among students through the design of team tasks and activities, and enhances their clinical thinking ability and practical operation skills.

4.3 Cultivate teamwork spirit and interdisciplinary communication ability

Diversified teaching mode Through a variety of teaching methods, to cultivate students' teamwork spirit and interdisciplinary communication ability. Through the introduction of real or virtual clinical cases, the case teaching method guides students to analyze and discuss, and cultivates their teamwork spirit and interdisciplinary

communication ability. Through simulating real clinical scenes, the simulation teaching method allows students to learn and master skills in practice, and cultivate their teamwork spirit and interdisciplinary communication ability. Problem-oriented learning (PBL) cultivates students' autonomous learning ability, innovative thinking, teamwork spirit and interdisciplinary communication ability by proposing and solving problems. Teamwork learning promotes cooperation and communication among students through the design of team tasks and activities, and cultivates their teamwork spirit and interdisciplinary communication ability.

5. PROMOTION AND APPLICATION OF DIVERSIFIED TEACHING MODE IN REHABILITATION THERAPY SPECIALTY

5.1 Optimization and innovation of teaching mode

The promotion and application of diversified teaching mode in rehabilitation therapy specialty requires continuous optimization and innovation of teaching mode. Teachers can improve the teaching effect by constantly summarizing and reflecting on the teaching practice, optimizing and innovating the teaching mode. For example, teachers can optimize and innovate the teaching mode and improve the teaching effect by introducing new teaching methods and means, such as virtual reality technology and online learning platform.

5.2 Teacher training and allocation of teaching resources

The popularization and application of diversified teaching mode need to strengthen teacher training and allocation of teaching resources. Teachers are the implementers of diversified teaching mode, and their teaching ability and level directly affect the teaching effect. Schools and medical institutions can improve teachers' teaching ability and level by carrying out teacher training, and promote the popularization and application of diversified teaching modes. In addition, schools and medical institutions also need to strengthen the allocation of teaching resources, provide necessary teaching facilities and equipment, and support the implementation of diversified teaching models.

5.3 Evaluation and feedback mechanism of teaching effect

The popularization and application of diversified teaching mode need to establish a scientific teaching effect evaluation and feedback mechanism. Teaching effect evaluation is an important means to test the effectiveness of teaching mode. Schools and medical institutions can establish a scientific teaching effect evaluation system to evaluate the implementation effect of diversified teaching mode, find and solve the problems in the teaching process, and improve the teaching effect. In addition, schools and medical institutions can also improve and optimize the teaching mode and enhance the teaching effect by establishing a teaching feedback mechanism to collect feedback from students and teachers.

6. CONCLUSION

This study systematically combs the application status and theoretical basis of diversified teaching mode in clinical teaching of rehabilitation therapy major at home and abroad, and analyzes the specific application scenarios and application effects of diversified teaching mode in rehabilitation therapy major. It is found that diversified teaching mode can significantly enhance students' learning interest and participation, enhance their clinical thinking ability and practical operation skills, and cultivate their teamwork spirit and interdisciplinary communication ability. The diversified teaching mode has obvious application effect in the clinical teaching of rehabilitation therapy specialty, and it is worth further popularization and application in educational practice.

This study mainly adopts the methods of literature review and theoretical analysis, and lacks empirical research and case analysis, so the universality and reliability of the research results need to be further verified. Future studies can further verify the application effect of diversified teaching mode in clinical teaching of rehabilitation therapy through empirical research and case analysis. In addition, future research can also explore the application effect of diversified teaching mode in other medical specialties, and enrich and improve the theory and practice system of diversified teaching mode.

REFERENCES

[1] Injayson. Application of multi-mode teaching method guided by case in comprehensive practical training of rehabilitation therapy technology [J]. Journal of Taizhou Vocational and Technical College, 2023, 23(4):89-92.

[2] HAO Chizi, Chen Xiang, Lu Junyan. The application of various teaching methods reform in the practice of Rehabilitation therapy [C]// National Academic Conference on Rehabilitation of Children with Cerebral Palsy and International Academic Exchange Conference.2010.

[3] Hong Aixiong. Application analysis of case teaching method in clinical teaching of rehabilitation nursing [J]. Journal of Dietary Health Care, 2021, 000(009):184.

[4] Li Kejun, Jiang Yongjun. Application research of "Trinity" teaching quality monitoring system in rehabilitation therapy professional practice [J]. Massage and rehabilitation medicine, 2016 (18) : 3. DOI: CNKI: SUN: AMYD. 0.2016-18-029.

[5] Huang Xiarong, Wang Ting, Hu Lizhi. Application of Web Quest teaching Model in the teaching of "Rehabilitation Medicine" [J]. Science and Education Guide, 2024(8):112-114.

[6] Wu Qi, Hou Zixin. Curriculum construction and teaching reform of "Clinical Rehabilitation" by integrating innovative teaching teams [J]. Education and Teaching Forum, 2023(2):81-84.

[7] Zou Yingjie, Zhang Hong, Qin Shuang, et al. Teaching practice of divided classroom model in Neurology course of Rehabilitation therapy specialty [J]. Science and Education Guide, 2022(9):3.

[8] Wu Chengji, Huang Zuoyi, Liu Lixia, et al. Research on Application of ATDE teaching model in clinical probation practice teaching of rehabilitation therapy [J]. Medical information, 2017, 30 (13) : 2. DOI: 10.3969 / j.i SSN. 1006-1959.2017.13.014.

[9] Wang Ming, Xue Qiuhong. Application of Seminar combined with CBL teaching model in clinical practice teaching of undergraduate rehabilitation therapy [J]. Southwest, 2020, 22 (6) : 3. DOI: 10.3969 / j.i SSN. 1672-7193.2020.06.034.

[10] Ma Suhui, Cui Ying, Chen Changxiang, et al. Improve the application of PBL teaching method in rehabilitation therapeutic specialty experiment [J]. Journal of chongqing medicine, 2010, 39 (16) : 3. DOI: 10.3969 / j.i SSN. 1671-8348.2010.16.032.

[11] Wu Qinfeng, Tong Weifeng. The application of the teaching model simulated patients in rehabilitation medicine teaching [J]. Journal of health vocational education, 2012, 30 (19) : 2. DOI: 10.3969 / j.i SSN. 1671-1246.2012.19.028.

[12] Zhang Guodong. Rehabilitation technology [J]. Journal of shallow of diversified teaching method in the teaching of contemporary education practice and teaching research, electronic, 2016 x (1) : 1. The DOI: 10.16534 / j.carol carroll nki cn13-9000 / g. 2016.0201.

Development of Diversified Governance Mechanisms for Rural Social Pension Systems

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Abstract: This study explores the construction and development of diversified governance mechanisms for rural social pension systems to address aging populations and insufficient rural social security. Methods include literature review and theoretical analysis, extracting key elements and pathways for diversified governance. The research reviews existing rural pension governance theories and models, analyzing their strengths, weaknesses, and applicability. It then categorizes and defines four dimensions of governance: government leadership, market participation, social organization cooperation, and family support, examining their interrelations and complementarities in practice. A theoretical framework for diversified governance is proposed, emphasizing the government's leading role while advocating for deep market and social engagement. The conclusion underscores the need for a collaborative governance system guided by national policies to enhance rural elderly care and social security.

Keywords: Rural social pension; Diversified governance; Family support; Government leadership; Market participation

1. INTRODUCTION

1.1 Research Background and Significance

Population aging is a major social issue currently faced globally. As the most populous country in the world, China is experiencing a particularly pronounced aging phenomenon. According to data from the National Bureau of Statistics, by 2021, the population aged 60 and above in China had reached 264 million, accounting for 18.7% of the total population. This phenomenon is even more evident in rural areas, where the increasing number of elderly people makes rural elderly care a growing challenge. However, compared to urban areas, rural areas are significantly lacking in elderly care resources, including facilities and services. Therefore, exploring and constructing a diversified social elderly care governance mechanism tailored to the actual conditions of rural areas is of utmost importance.

Against the backdrop of social transformation in China, rural elderly care is not just a livelihood issue but also involves social stability and economic development. An effective rural elderly care governance mechanism can not only improve the quality of life for the elderly but also free up the labor force of the middle-aged and young, promoting rural economic development. Hence, researching diversified governance mechanisms for rural social elderly care is of significant theoretical and practical importance for advancing rural social governance modernization and enhancing social harmony in rural areas. Furthermore, the National People's Congress has repeatedly emphasized the need to improve the rural social security system and enhance the quality of life for the elderly in rural areas, providing direction for this research.

1.2 Research Objectives and Methods

The objective of this research is to construct a diversified social elderly care governance mechanism suitable for the actual conditions of rural China. By analyzing the current status and governance mechanisms of rural elderly care both domestically and internationally, the research aims to propose a scientific and feasible rural elderly care governance model. The research methods mainly include literature review and theoretical analysis. By reviewing and comparing relevant literature from both domestic and international sources, a systematic understanding of diversified

governance mechanisms for rural elderly care is formed.

By examining the research outcomes related to rural elderly care governance mechanisms, the study summarizes the main content and shortcomings of current research. The theoretical analysis employs diversified governance theory to elaborate on the basic concepts and implementation paths for constructing a diversified governance mechanism for rural elderly care. Based on this, and in conjunction with the spirit of the National People's Congress and current social issues, the feasibility and effectiveness of diversified governance mechanisms in practical applications are deeply explored.

1.3 Review of Domestic and International Research Status

Domestically, Tu Yuming (2022) pointed out that rural elderly care faces major issues such as funding shortages and insufficient service provision [1]. Long Cuifang and Huang Weimao (2023) analyzed the development status of rural institutional elderly care in Zunyi City, Guizhou Province through empirical data, revealing the difficulties and challenges of rural institutional elderly care [2]. Guo Jiali (2018) argued that the rural elderly care mechanism is transitioning from a single system to a diversified one, which is an inevitable result of increasing market and social participation [3]. Liu Xiaohua (2024) emphasized the important role of farmers' professional cooperatives in the rural social governance mechanism [4].

Internationally, countries like the United States, Germany, and Japan have addressed rural elderly care issues through well-established social security systems, forming mature diversified supply models. The U.S. social security system includes various forms such as social insurance, assistance, and community services. Japan provides comprehensive elderly services through the "Community Comprehensive Care System," while Germany's long-term care insurance system is a government-led, privately operated model.

Studying domestic and international governance experiences and theoretical foundations can provide important references and insights for the construction and development of diversified governance mechanisms for rural elderly care in China.

2. THEORETICAL FOUNDATION OF DIVERSIFIED GOVERNANCE MECHANISM FOR RURAL SOCIAL ELDERLY CARE

2.1 Overview of Diversified Governance Theory

Diversified governance theory advocates that in the process of managing social public affairs, the government is no longer the sole leader but collaborates with various entities such as the market and society to jointly solve social problems. The core of this theory lies in forming a diversified cooperative governance system among the government, market, and society to achieve optimal resource allocation and comprehensive social progress. In the field of rural social elderly care, the core idea of a diversified governance mechanism is to create a diversified and systematic elderly care service system through government guidance, market operations, and social participation.

2.2 Specificity and Needs Analysis of Rural Social Elderly Care

Rural social elderly care has distinct characteristics, mainly reflected in three aspects: population structure, economic conditions, and social support networks.

First, the aging degree in rural areas is generally higher than in urban areas, with a larger proportion of elderly people, putting immense pressure on the rural elderly care service system. According to data from the National Bureau of Statistics, the proportion of people aged 60 and above in rural areas is higher than in urban areas, and this proportion is continuously rising.

Second, the economic development in rural areas is relatively lagging, and the economic conditions of the elderly are limited, making it difficult to afford high elderly care costs. Surveys indicate that rural elderly mainly rely on land income and family support, and the shortage of elderly care funds is a common phenomenon. The rural social security system is not well-developed, and the basic pension level for farmers is low, making it difficult to meet the basic living needs of the elderly.

Third, the social support network in rural areas is relatively weak, and the traditional family elderly care function is gradually weakening. With the acceleration of urbanization, a large

number of young and middle-aged laborers are migrating to cities for work, leading to a serious "empty-nest" problem among rural elderly. The absence of family members results in a lack of emotional support and daily care for the elderly, further complicating the rural elderly care issue.

Based on the above specificity and needs analysis, constructing a diversified governance mechanism for rural social elderly care requires fully considering the actual conditions of rural areas and integrating resources from the government, market, and society to form a comprehensive diversified elderly care service system.

3. COMPONENTS OF DIVERSIFIED GOVERNANCE MECHANISM FOR RURAL SOCIAL ELDERLY CARE

3.1 Government Leadership

The government plays a crucial leading role in the governance mechanism of rural social elderly care, manifested in policy formulation, funding, and resource allocation. First, the government needs to formulate and improve relevant policies and laws for rural social elderly care to provide legal and policy support for the diversified governance mechanism. This includes establishing a sound social pension insurance system, raising the pension level for rural elderly, and introducing special elderly care service policies.

Second, the government should increase investment in rural social elderly care in the fiscal budget to ensure the provision of basic elderly care services. Considering the relatively weak economic conditions of rural elderly, the government should provide necessary financial support, such as living subsidies and medical subsidies for the elderly, to alleviate their economic burden. Data from the Ministry of Finance in 2021 shows that the national expenditure on social security and services for the elderly has been increasing year by year, becoming an important part of national social security expenditure.

Additionally, the government should play a role in integrating and coordinating resources to optimize the allocation of elderly care service resources. For example, by procuring elderly care services and introducing social capital to build elderly care facilities, the government can improve the efficiency and quality of elderly care services. The government should also encourage and support the construction of community elderly care service centers to meet the local elderly care needs of rural elderly.

3.2 Market Participation

Market participation in rural social elderly care services can compensate for the lack of government resources and leverage the flexibility and efficiency of market mechanisms. Market participation mainly manifests in the supply of elderly care services and commercial insurance.

First, in the supply of elderly care services, the market can invest in and establish elderly care institutions, providing diversified elderly care services such as professional nursing, rehabilitation therapy, and health management, thereby improving the quality and level of elderly care services. Market mechanisms can introduce competition, prompting elderly care institutions to continuously improve service standards and management levels.

Currently, some large enterprises and social capital have begun to enter the elderly care service industry, providing high-quality and diversified elderly care services for rural elderly. For instance, companies like Capital Medical and Taikang Life have established professional elderly care facilities in many regions across the country, offering not only basic life care but also rehabilitation medical services and cultural entertainment.

In terms of commercial insurance, the market can introduce various elderly care insurance products to share the economic risks of elderly care for the elderly. For example, by developing long-term care insurance and commercial pension insurance products, the market can fill the gaps in basic social pension insurance and enhance the living security level of the elderly. The professional management and innovation capabilities of commercial insurance companies can provide more choices and security for rural elderly.

3.3 Collaboration with Social Organizations

Social organizations play an important auxiliary role in rural social elderly care, complementing the government and market in the supply of elderly care services. Social organizations include non-governmental organizations (NGOs), volunteer

organizations, and community organizations, which have unique advantages in providing emotional support, daily care, and spiritual comfort.

For instance, some charitable and public welfare organizations have initiated various elderly care service projects in rural areas, such as "mutual aid elderly care" and neighborhood watch programs. These projects not only address the living difficulties of some elderly people but also enhance community cohesion. Volunteer and community organizations can also enrich the cultural lives of the elderly and improve their quality of life and happiness through various activities.

For example, the "Caring for Empty-Nest Elderly" initiative involves volunteers regularly visiting the elderly, providing psychological counseling and daily care services. These services not only fill the gap left by family elderly care but also inject humanistic care into rural social elderly care.

3.4 Family Support

The family plays a fundamental role in rural social elderly care. Traditionally, the family is the primary reliance for the elderly, and the obligation of children to support their parents is an important aspect of family elderly care. However, with social and economic development, family structures have undergone significant changes, and the phenomenon of "empty-nest families" in rural areas is becoming increasingly common, challenging the traditional family elderly care model.

Despite these changes, the family remains an important force in rural elderly care. To enhance the family's elderly care function, it is necessary to strengthen the elderly care awareness of family members and promote the traditional virtue of respecting and honoring parents. Additionally, government and social support are needed to alleviate the burden of family elderly care. For example, providing economic subsidies and tax exemptions can encourage family members to fulfill their elderly care obligations.

By combining the efforts of the above aspects, a diversified rural social elderly care governance mechanism can be formed. This mechanism involves government leadership, market and social participation, and family support, effectively addressing the aging issue in rural areas and improving the quality of life and social security level of rural elderly.

4. PATHWAYS TO CONSTRUCTING A DIVERSIFIED GOVERNANCE MECHANISM FOR RURAL SOCIAL ELDERLY CARE

4.1 Government's Leading Role in Top-Level Design

In constructing a diversified governance mechanism for rural social elderly care, the government needs to play a leading role in top-level design, formulating comprehensive elderly care policies and plans to ensure coordinated cooperation among multiple entities. First, the government should develop a scientific elderly care policy system covering pension security, elderly care services, and the construction of elderly care facilities. Establishing and improving laws and regulations will provide a legal foundation for the diversified governance mechanism.

Additionally, the government should increase investment in rural social elderly care in the fiscal budget, providing financial support and policy incentives to attract social capital and market forces to participate in the supply of rural elderly care services. For instance, through tax exemptions and subsidies, the government can encourage private enterprises and social organizations to engage in the elderly care service industry, offering diversified elderly care services to meet the multi-level needs of the elderly.

The government should also enhance the supervision and evaluation of elderly care services to ensure service quality and safety. For example, by establishing elderly care service standards and implementing strict supervision mechanisms, the government can conduct regular inspections and evaluations of elderly care institutions to protect the basic rights of the elderly.

4.2 Role of Market Mechanisms in Elderly Care Service Supply

Market mechanisms play a crucial role in rural social elderly care governance, improving the efficiency and quality of elderly care service supply through market operations. The participation of market mechanisms can be carried out in the following aspects:

First, encourage and support social capital to invest in and establish elderly care institutions,

providing diversified elderly care services such as professional nursing, rehabilitation therapy, and health management. Currently, several large enterprises in China have made arrangements in the elderly care service field. Through market operations, the supply capacity of elderly care services is not only enhanced, but the standardization and professionalization of elderly care services are also promoted.

Second, develop and promote various elderly care insurance products, sharing the economic risks of elderly care for the elderly through commercial insurance and improving their living security level. The government can guide commercial insurance companies to develop elderly care insurance products suitable for rural elderly, partially filling the gaps in basic social pension insurance.

Additionally, market mechanisms can introduce competition, improving service quality and management levels. For example, through government procurement of elderly care services, selecting elderly care institutions with high service quality and management levels can provide high-quality elderly care services for the elderly.

4.3 Supplementary Role of Social Organizations in Elderly Care Services

Social organizations play an indispensable role in rural social elderly care governance, especially in providing emotional support, daily care, and spiritual comfort. Social organizations include NGOs, volunteer organizations, and community organizations, which have extensive grassroots foundations and flexible operational methods in rural areas. Social organizations can provide services for rural elderly through various public welfare projects. For instance, some charitable and public welfare organizations have initiated projects like "mutual support elderly care" and "neighborhood mutual aid" in rural areas. These projects involve volunteers regularly visiting elderly people to provide daily care and psychological counseling. Such services not only solve some of the living difficulties faced by elderly individuals but also enhance community cohesion.

Moreover, social organizations can enrich the cultural lives of the elderly and improve their quality of life through various cultural activities. For example, organizing cultural performances, senior interest groups, and other activities can provide platforms for the elderly to engage and showcase their talents, boosting their sense of social participation and happiness.

4.4 The Fundamental Role of Family Support in Elderly Care

The family remains a fundamental pillar in rural social elderly care. Despite the changes in family structures due to social and economic development, the family continues to be a crucial support system for the elderly. To enhance the family's role in elderly care, several measures can be taken:

Strengthening the awareness of elderly care among family members and promoting the traditional virtue of respecting and honoring parents. Educational campaigns can be conducted to emphasize the importance of elderly care and encourage family members to fulfill their responsibilities.

Providing support from the government and society to alleviate the burden of family elderly care. Measures such as economic subsidies and tax exemptions can incentivize family members to take on elderly care responsibilities. For example, the government can offer financial subsidies to children who care for their elderly parents, reducing the economic pressure associated with elderly care.

Encouraging families to interact more with community and social organizations to form a collaborative network that addresses the elderly care needs. The establishment of community elderly care service centers can provide nearby daily care and psychological counseling services, easing the burden on families in caring for elderly members.

By integrating efforts from the government, market, social organizations, and families, a diversified governance mechanism for rural social elderly care can be established. This mechanism will effectively address the challenges of aging in rural areas and improve the quality of life and social security for the elderly.

5. CASE STUDIES AND PRACTICAL APPLICATIONS

5.1 Successful Models in Domestic Rural Areas

Analyzing successful models in different rural

areas can provide practical insights into the implementation of diversified governance mechanisms for rural social elderly care. For example, some rural regions have effectively integrated government policies, market services, social organization activities, and family support to create comprehensive elderly care systems. These case studies can highlight best practices and lessons learned, offering valuable guidance for other regions.

5.2 International Experiences and Their Applicability

Examining international experiences in rural elderly care can also provide useful references for China. Countries like the United States, Germany, and Japan have developed mature diversified elderly care systems through well-established social security frameworks. By studying their approaches, such as community-based care in Japan or long-term care insurance in Germany, China can adapt and apply relevant strategies to its rural elderly care system, considering the unique characteristics of its rural population.

6. CONCLUSION

In conclusion, constructing a diversified governance mechanism for rural social elderly care is essential for addressing the aging issue in rural China. This mechanism should involve the coordinated efforts of the government, market, social organizations, and families. By leveraging the strengths of each entity, a comprehensive and effective elderly care system can be established, improving the quality of life for rural elderly and ensuring social stability and economic development.

The government should take the lead in policy formulation, funding, and resource allocation, while the market should enhance service supply through competition and innovation. Social organizations should provide supplementary emotional and daily care support, and families should continue to play a fundamental role in elderly care. By integrating these efforts, a robust diversified governance mechanism can be achieved, benefiting the rural elderly population and society as a whole.

REFERENCES

[1] Tu Yuming. Construction and Development of Diversified Governance Mechanism for Rural Social Elderly Care[J]. Journal of Jilin Radio and TV University, 2022(6):102-104.

[2] Long Cuifang, Huang Weimao. Development Challenges and Coping Mechanisms of Rural Institutional Elderly Care: A Study Based on Data from Zunyi City, Guizhou Province[J]. Jianghan Academic, 2023, 42(2):89-98.

[3] Guo Jiali. Transition from Single to Diversified: Analysis of Changes in Rural Social Elderly Care Mechanisms[J]. Journal of Shenyang University: Social Science Edition, 2018, 20(4):6.

[4] Liu Xiaohua. Farmers' Professional Cooperatives and Innovation in Rural Social Governance Mechanisms[D]. Guangxi Normal University, [2024-08-23].

[5] Hu Xiaoya. Basic Ideas for Rural Socialized Governance[J]. Shanghai Rural Economy, 2015(5):4.

[6] Tianjin Daily. Guaranteeing Pay for Work, Rest and Vacation, Enjoying Social Insurance and Skills Training[J]. Tianjin Daily, 2015.

[7] Huang Hui, Lu Yihua. Principles and Operational Mechanisms for Constructing a Rural Elderly Care Service System[J]. Nanjing Social Sciences, 2023(12):74-82.

[8] Tang Zihan. New "Brokerage Mechanism": Innovation in the Collaborative Governance Mechanism of Rural Governance - A Case Study of Zhanqi Village, Pidu District, Chengdu City[D]. Southwestern University of Finance and Economics, 2020.

[9] Wei Tianhong. Research on Improving Rural Governance Mechanisms in the Context of Rural Revitalization[D]. Southwest University of Political Science and Law, 2020.

[10] Yuan Xiaofeng. Analysis of Rural Grassroots Social Governance System from an Institutional Perspective[J]. Modern Economic Information, 2017(12):1.

[11] Zhao Qiuqian. Construction of Rural Social Governance Model through the Interaction of Farmers' Cooperatives and Village Committees in Yulin City, Shaanxi Province[D]. Yan'an University, [2024-08-23].

Exploring Theoretical Models of Psychological Counseling and Guidance for Higher Vocational Students

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Abstract: This study aims to explore theoretical models suitable for psychological counseling and guidance for higher vocational (HV) students, addressing their mental health needs related to academic pressure, career planning, and interpersonal relationships. By systematically reviewing and analyzing domestic and international literature on psychological counseling and guidance, this paper reveals the current research status and theoretical foundations in the field. The methodology includes literature review and theoretical analysis. We comprehensively evaluated various counseling and guidance models, such as Carl Rogers' person-centered therapy, Albert Ellis' Rational Emotive Behavior Therapy (REBT), and domestic models like the "self-development" model and the "problem-tracing-root" model. By comparing these models' theoretical bases, application scope, and practical effects, we further explored their suitability for HV students. Additionally, this paper examines the feasibility and implementation strategies of group counseling and "online + offline" hybrid models, considering the unique psychological characteristics and needs of HV students. The findings indicate that different models have distinct features and advantages; a diversified approach can more effectively meet HV students' psychological counseling needs. Finally, we propose a theoretical framework for counseling and guidance tailored to HV students, emphasizing the integration of multiple models, personalized counseling, and the auxiliary role of information technology. The study's conclusions provide guidance for practical psychological counseling in HV education and offer theoretical support and practical references for mental health educators.

Keywords: Psychological Counseling; Higher Vocational Students; Theoretical Models; Multimodal Integration; Personal Development

1. INTRODUCTION
1.1 Research Background and Significance
Higher vocational education (hereafter referred to as "vocational education") holds a significant position within China's educational system, producing a substantial number of skilled and applied talents for society. However, vocational students often face considerable psychological stress and challenges when dealing with academic, internship, and future career pressures. Common mental health issues among vocational students include anxiety, depression, and emotional instability, which can affect their overall quality of life and academic performance. Therefore, providing scientific and effective psychological counseling and guidance for vocational students has become an urgent and critical task in educational practice.

1.2 Review of Domestic and International Research
Psychological counseling and guidance theories have garnered extensive attention both domestically and internationally. Tian Renbo (2024) [1] explored the theoretical foundations of psychological health education models in universities, proposing a multi-theoretical framework that advances systematic development in mental health education. Hu Xiaoxia (2001) [2] examined the implementation paths of the "self-development" model for vocational psychological counseling, emphasizing the importance of self-awareness and personal growth. Ge Jinwen (2008) [3] provided theoretical insights into psychological

counseling modes in secondary education, highlighting the "problem-tracing-root" model's effectiveness.

In international research, Western countries have developed mature practices in psychological counseling and guidance. Carl Rogers' person-centered therapy emphasizes respect for individual autonomy and guides self-discovery and growth. Albert Ellis' Rational Emotive Behavior Therapy (REBT) focuses on the relationship between cognition and emotion, aiming to improve emotional well-being through cognitive adjustments. While these theories and practices provide valuable insights, their application in China's vocational education context requires localization to align with the cultural and student-specific characteristics.

1.3 Research Objectives and Methods

This study aims to explore theoretical models suitable for psychological counseling and guidance for vocational students. Specifically, it analyzes existing counseling theories and models, combining them with the psychological characteristics and needs of vocational students to develop practical and effective counseling models. The research methods include literature analysis and field surveys. Literature analysis involves collecting, organizing, and analyzing relevant domestic and international research to understand the theoretical frameworks and practical experiences in psychological counseling. Field surveys, including questionnaires and interviews with vocational students, aim to gain an in-depth understanding of their mental health status and counseling needs, providing data support for theoretical model construction.

2. THEORETICAL FOUNDATIONS OF PSYCHOLOGICAL COUNSELING AND GUIDANCE FOR VOCATIONAL STUDENTS

2.1 Basic Concepts of Psychological Counseling and Guidance

Psychological counseling and guidance involve helping individuals resolve psychological issues and restore mental health through psychological methods. The primary goals are to enhance self-awareness, improve emotional regulation and social adaptation, and promote overall development. For vocational students, who are in a critical phase of psychological development and career decision-making, psychological counseling is particularly important. It can help them manage academic stress, resolve emotional issues, and provide guidance in career planning and future development.

2.2 Psychological Characteristics and Needs of Vocational Students

Vocational students have unique psychological characteristics and needs. Predominantly aged 18-22, they are in a crucial stage of psychological development and self-identity formation, facing issues such as academic pressure, employment concerns, and interpersonal relationship difficulties. Furthermore, vocational students often come from diverse socio-economic backgrounds, with some experiencing financial hardships, exacerbating their psychological stress. Therefore, their psychological needs primarily focus on emotional regulation, academic and career counseling, and interpersonal relationship guidance.

2.3 Theoretical Models of Psychological Counseling and Guidance

Existing theoretical models of psychological counseling and guidance offer diverse options for vocational student counseling. Carl Rogers' person-centered therapy emphasizes unconditional positive regard, empathy, and genuineness, creating a supportive environment for self-exploration and self-actualization. Albert Ellis' REBT focuses on altering irrational beliefs to improve emotional responses and solve practical problems. These models each have distinct features and should be applied flexibly based on the specific circumstances of vocational students.

3. EXPLORATION OF COUNSELING AND GUIDANCE MODELS FOR VOCATIONAL STUDENTS

3.1 Self-Development Model

Hu Xiaoxia (2001) [2] proposed the "self-development" model, emphasizing self-awareness, growth, and improvement. This model encourages students to reflect on their strengths and weaknesses, establish a positive self-concept, and enhance self-efficacy and self-regulation. In practice, tools such as psychological assessments and individual

counseling help students understand themselves comprehensively and create personalized growth plans. During counseling, advisors can guide students in analyzing their interests, personalities, and abilities, aiding in rational career planning and providing support and guidance in achieving their goals.

3.2 Group Counseling Model

The group counseling model leverages small group interactions to promote communication and support among members, achieving psychological counseling effects. Li Houyi (2023) [6] demonstrated the effectiveness of group counseling in vocational students' mental health education. In this model, counselors design a series of group activities, such as role-playing, group discussions, and situational simulations, to guide students in expressing emotions, solving problems, and enhancing teamwork awareness. Mutual support within the group can also alleviate individual loneliness and pressure, improving overall psychological health.

3.3 Online + Offline Model

The development of modern information technology has made online counseling a burgeoning trend. Yang Xuejie et al. (2022) [5] proposed the "online + offline" counseling model, combining online psychological assessments, counseling, and offline guidance to achieve flexibility and broad reach. Online platforms offer timely and convenient mental health services, such as 24-hour online counseling and mental health education. Offline counseling facilitates in-depth case analysis and psychological intervention through face-to-face interactions. This model is particularly suitable for vocational students, providing continuous psychological support in various scenarios.

4. IMPLEMENTATION STRATEGIES FOR PSYCHOLOGICAL COUNSELING AND GUIDANCE FOR VOCATIONAL STUDENTS

4.1 Establishing a Professional Counseling Team

Effective counseling and guidance require support from a professional team. Vocational colleges should establish a team of experienced and skilled mental health professionals, including certified counselors, advisors, and educational psychology experts.

Regular training and exchanges should be conducted to enhance the overall competence of the team. Additionally, schools should collaborate with external mental health resources, such as counseling centers and medical institutions, to share resources and enhance the coverage and professionalism of counseling services.

4.2 Providing Diverse Mental Health Education

Vocational colleges should prioritize mental health education by offering various activities such as mental health lectures, courses, and salons. These initiatives help to raise students' awareness of mental health and improve their self-regulation skills. Furthermore, creating a supportive psychological culture on campus through events like Mental Health Week and competitions can foster a positive environment and increase student engagement and well-being.

4.3 Utilizing Technological Tools for Counseling

The advancement of modern information technology provides new tools and platforms for counseling and guidance. Vocational colleges can leverage smartphone apps and online platforms for remote psychological assessments, counseling, and mental health education. Introducing virtual reality (VR) technology can offer immersive counseling experiences, helping students develop coping strategies and emotional regulation skills through simulated scenarios. Additionally, data analytics can be used to monitor students' mental health dynamically, enabling timely identification and intervention of issues, thus providing a scientific basis for counseling.

5. CONCLUSION

By systematically reviewing domestic and international research on psychological counseling and guidance for vocational students, this paper explored several counseling models applicable to vocational students, such as the self-development model, group counseling model, and the "online + offline" model. These models effectively enhance vocational students' mental health and overall quality. However, their implementation faces challenges such as data privacy protection, faculty training, and standardization of technology. To further

advance the scientific, professional, and international development of psychological counseling and guidance for vocational students, continuous exploration of new methods and strategies is needed in both research and practice to better support the growth and development of vocational students.

REFERENCES

[1] Tian Renbo. Theoretical Research on Psychological Health Education Models in Higher Education [D]. Southwest University of Political Science and Law, 2024-08-23. DOI: CNKI:CDMD:2.2008.201865.

[2] Hu Xiaoxia. Exploration of the "Self-Development" Model in Vocational Psychological Counseling [J]. Journal of Ningbo Polytechnic, 2001, 1(3): 62-64. DOI: 10.3969/j.issn.1671-2153.2001.03.021.

[3] Ge Jinwen. Exploration of the "Problem-Tracing-Root" Psychological Counseling Model for Secondary Students [J]. Shanghai Educational Research, 2008(6): 33-34. DOI: 10.3969/j.issn.1007-2020.2008.06.012.

[4] Chen Gong, Jiang Wanbo. Analysis and Educational Exploration of the Mental Health Status of Vocational Students [J]. New West (Second Half of the Month), 2008. DOI: CNKI:SUN:XXBL.0.2008-09-108.

[5] Yang Xuejie, Gao Xiaohong, Jiao Pengxiao. Exploration of the "Online + Offline" Counseling Model: A Case Study of Yuncheng Experimental Middle School, Shanxi Province [J]. Information Technology Education in Primary and Secondary Schools, 2022(5): 4.

[6] Li Houyi. The Application of Group Counseling in Vocational Mental Health Education [J]. Industry and Technology Forum, 2023, 22(15): 255-256.

[7] Huang Weifeng. Exploration of Psychological Counseling Models in Universities from an Ecological Cooperation Perspective [J]. Education and Teaching Forum, 2018(1): 2. DOI: 10.3969/j.issn.1674-9324.2018.01.048.

[8] Liang Liping. Theoretical Considerations and Practical Exploration of Student Peer Counselors: A Case Study of the Peer Counselor Training at Our University in 2006 and 2007 [J]. Journal of Chongqing University of Posts and Telecommunications: Social Science Edition, 2008(S1): 3.

[9] Chang Yongcai. A New Trend in Counseling and Guidance: Increasing Attention to Cultural Factors—A Review of Multicultural Counseling Overseas [J]. Journal of Ethnic Education, 2000(4): 59-63. DOI: CNKI:SUN:MZJY.0.2000-04-009.

Impact of User-Generated Content on Consumer Brand Attachment in Cross-Border E-commerce B2C Platforms

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Abstract: This study aims to explore the impact of user-generated content (UGC) on consumer brand attachment in cross-border e-commerce B2C platforms. With the rapid development of globalization and internet technology, cross-border e-commerce has become a crucial part of international trade. UGC, as an emerging form of consumer interaction, is profoundly changing the relationship between consumers and brands. Through literature review and theoretical analysis, this paper systematically examines the definition, characteristics, and application of UGC in cross-border e-commerce platforms, and explores the mechanisms through which UGC influences consumer brand attachment. Initially, the concept of UGC is elaborated, and its specific manifestations in cross-border e-commerce platforms, such as user reviews, ratings, and sharing, are analyzed. Then, from psychological and sociological perspectives, the paper discusses how UGC enhances consumer engagement, trust, and sense of belonging, thereby influencing brand attachment. The study finds that UGC not only enhances consumer brand awareness and emotional attachment but also strengthens brand loyalty and purchase intention through social interaction and word-of-mouth. Finally, several theoretical hypotheses are proposed, and future research directions are outlined, suggesting that scholars explore UGC's impact across different cultural contexts and market environments from multidisciplinary perspectives. This study aims to provide theoretical support and practical guidance for brand management and marketing strategies in cross-border e-commerce platforms, fostering sustainable development in the industry.
Keywords: Cross-Border E-Commerce; B2c Platform; User-Generated Content; Brand Attachment; Consumer Behavior

1. INTRODUCTION

1.1 Research Background and Significance

Cross-border e-commerce B2C platforms, as products of globalization and the digital economy, have become integral to international trade. With advancements in internet technology and the refinement of global logistics networks, consumers can effortlessly purchase goods from around the world via these platforms. Cross-border e-commerce breaks traditional trade's time and space limitations, offering more choices and convenience to consumers. Particularly during the COVID-19 pandemic, the advantages of cross-border e-commerce have become more pronounced, making it a crucial option for many businesses and consumers.

In cross-border e-commerce B2C platforms, user-generated content (UGC) is reshaping the relationship between consumers and brands. UGC includes user reviews, ratings, and shares, reflecting genuine user experiences and significantly influencing other consumers' purchasing decisions. Studying the impact of UGC on consumer brand attachment aids in understanding consumer behavior changes and provides theoretical support and practical guidance for brand management and marketing strategies.

1.2 Literature Review

Scholars have made significant progress in researching cross-border e-commerce and UGC. Wang Lin et al. (2020) used fsQCA to explore factors influencing brand attachment in cross-border e-commerce, offering new insights into consumer-brand relationships. Liu Yingjun (2023) discussed the development of educational materials for

cross-border e-commerce B2C platform operations, emphasizing the importance of talent cultivation for industry development. Qiao Huanhuan (2018) and Wen Qiuhua, Wang Haigang (2017) analyzed platform selection strategies for small and medium enterprises, highlighting the critical role of platform choice in export business. He Ying (2017) provided empirical evidence for platform selection by comparing export platforms for outward-oriented enterprises.

Internationally, Ji Xuejun (2024) analyzed the overall impact of B2C cross-border e-commerce platforms on China's foreign trade, noting that while platforms facilitate trade, they also pose new challenges. Ye Zhenghao (2018) and Luo Jun (2017) explored specific impacts on China's foreign trade and techniques for preventing customer disputes, respectively, using Alibaba's AliExpress as a case study, offering practical guidance for platform management.

Despite rich theoretical and empirical evidence, deeper exploration of the relationship between UGC and brand attachment is lacking. Future research can delve into UGC's impact mechanisms on consumer brand attachment from multidisciplinary perspectives, providing theoretical support and practical guidance for the sustainable development of cross-border e-commerce.

1.3 Research Objectives and Questions

This study aims to investigate the impact of user-generated content (UGC) on consumer brand attachment in cross-border e-commerce B2C platforms. Specific research questions include: What are the manifestations of UGC in cross-border e-commerce platforms? How does UGC enhance consumer engagement, trust, and a sense of belonging, thereby influencing brand attachment? What are the specific mechanisms through which UGC affects brand awareness, emotional attachment, brand loyalty, and purchase intention? This study seeks to provide theoretical support and practical guidance for brand management and marketing strategies in cross-border e-commerce platforms.

2. THEORETICAL FRAMEWORK

2.1 Definition and Characteristics of Cross-Border E-Commerce B2C Platforms

Cross-border e-commerce B2C platforms utilize internet technology to sell goods from one country to another directly to end consumers. Unlike traditional B2B cross-border e-commerce, B2C platforms offer convenience, diverse products, and transparent pricing. They provide consumers with more choices and convenience and offer businesses new channels to expand into international markets.

These platforms typically feature a wide range of products, including apparel, electronics, and home goods, meeting diverse consumer needs. They use big data and AI to offer personalized recommendations, enhancing the shopping experience. They collaborate with logistics companies to provide fast and convenient cross-border shipping, reducing delivery times. Additionally, they offer multiple payment methods for convenient cross-border transactions.

2.2 Definition and Characteristics of User-Generated Content (UGC)

User-generated content (UGC) refers to content created and published by users, including text, images, and videos. In cross-border e-commerce B2C platforms, UGC mainly comprises reviews, ratings, and shares, reflecting genuine user experiences and significantly affecting other consumers' purchasing decisions.

UGC is characterized by authenticity and credibility, as it is created by real users and reflects their genuine experiences. It has interactivity and spreadability, allowing users to interact through comments, likes, and shares, and can be widely disseminated via social media. UGC is diverse and rich, with users expressing their views through various formats, making the content more varied and informative. Moreover, UGC has influence and guidance, impacting other users' purchasing decisions and shaping brand image and reputation.

2.3 Overview of Consumer Brand Attachment Theory

Brand attachment refers to consumers' emotional dependence and loyalty towards a brand, representing a deep emotional connection between consumers and brands. It includes brand awareness, emotional attachment, loyalty, and purchase intention, influenced by factors such as brand image,

quality, and service.

The theoretical foundation of brand attachment comprises: emotional connection, where consumers' attachment includes brand awareness and emotional dependence; long-term relationship, as brand attachment develops over time through continuous interaction; multidimensional relationships, encompassing brand awareness, emotional dependence, loyalty, and purchase intention; and dynamic relationships, as various factors, including brand image, quality, and service, influence the formation and maintenance of brand attachment.

3. RESEARCH METHODS

3.1 Literature Review Method

The literature review method involves systematically collecting, organizing, and analyzing existing research to understand the current state and trends in the field, providing a theoretical foundation and reference for the study. This paper employs the literature review method to systematically examine research on cross-border e-commerce B2C platforms, user-generated content (UGC), and consumer brand attachment, exploring the mechanisms through which UGC influences consumer brand attachment.

3.2 Theoretical Analysis Method

The theoretical analysis method involves analyzing and synthesizing existing theories to propose new hypotheses and perspectives, providing theoretical support and an explanatory framework for the study. This paper uses the theoretical analysis method to explore how UGC enhances consumer engagement, trust, and a sense of belonging, thereby influencing brand attachment, from psychological and sociological perspectives.

4. MECHANISMS OF UGC'S IMPACT ON CONSUMER BRAND ATTACHMENT

4.1 Specific Manifestations of UGC in Cross-Border E-commerce B2C Platforms

In cross-border e-commerce B2C platforms, UGC primarily manifests as user reviews, ratings, and shares. These contents not only reflect users' genuine experiences and feelings but also significantly influence other consumers' purchasing decisions. User reviews are a major form of UGC, allowing users to express their views and feelings through text, images, and videos. User ratings are another important form, enabling users to evaluate products through scoring. User shares are the third major form, allowing users to share their shopping experiences and feelings through social media channels.

4.2 Impact of UGC on Consumer Engagement

UGC enhances consumer engagement, thereby influencing brand attachment. Engagement refers to the degree and level of consumer participation and involvement in brand interactions. UGC provides a platform for consumers to express their views and feelings, enabling them to actively participate in brand interactions. Through comments, ratings, and shares, consumers can not only express their views and feelings but also interact with other users, enhancing their engagement. Increased engagement deepens consumers' emotional dependence and loyalty to the brand, forming brand attachment.

4.3 Impact of UGC on Consumer Trust

UGC enhances consumer trust, thereby influencing brand attachment. Trust refers to the degree and level of consumer trust and dependence on the brand. As content created by real users, UGC has high authenticity and credibility, which can enhance consumers' trust in the brand. By reading other users' reviews and ratings, consumers can understand the real situation and usage experience of the products, strengthening their trust in the brand. Increased trust deepens consumers' emotional dependence and loyalty to the brand, forming brand attachment.

4.4 Impact of UGC on Consumer Sense of Belonging

UGC enhances consumers' sense of belonging, thereby influencing brand attachment. Belonging refers to the sense of belonging and identification consumers feel during brand interactions. UGC provides a platform for consumers to interact and communicate with other users, allowing them to find a sense of belonging in the brand community. Through comments, ratings, and shares, consumers can not only express their views and feelings but also interact with other users, enhancing their sense of belonging. Increased sense of belonging deepens consumers' emotional dependence and loyalty to the brand, forming brand attachment.

5. RELATIONSHIP BETWEEN UGC AND BRAND ATTACHMENT

5.1 UGC Enhances Brand Awareness and Emotional Attachment

UGC enhances consumers' brand awareness and emotional attachment, thereby influencing brand attachment. Brand awareness refers to the degree and level of consumer understanding and knowledge of the brand. As content created by real users, UGC can provide rich brand information and usage experiences, enhancing consumers' brand awareness. Emotional attachment refers to consumers' emotional dependence and loyalty to the brand. UGC enhances consumers' engagement, trust, and sense of belonging, improving their emotional attachment to the brand. Increased brand awareness and emotional attachment deepen consumers' emotional dependence and loyalty to the brand, forming brand attachment.

5.2 UGC Strengthens Brand Loyalty and Purchase Intention

UGC strengthens consumers' brand loyalty and purchase intention, thereby influencing brand attachment. Brand loyalty refers to the degree and level of consumer loyalty and dependence on the brand. UGC enhances consumers' engagement, trust, and sense of belonging, strengthening their brand loyalty. Purchase intention refers to consumers' willingness and behavior to purchase the brand. UGC provides rich brand information and usage experiences, enhancing consumers' purchase intention. Strengthened brand loyalty and purchase intention deepen consumers' emotional dependence and loyalty to the brand, forming brand attachment.

5.3 Role of Social Interaction and Word-of-Mouth

UGC further influences consumers' brand attachment through social interaction and word-of-mouth. Social interaction refers to the process of consumers interacting and communicating with other users in the brand community. UGC provides a platform for consumers to interact and communicate with other users, enhancing their engagement and sense of belonging. Word-of-mouth refers to the process of consumers spreading brand information and usage experiences through UGC. As content created by real users, UGC has high credibility and influence, which can influence other consumers' purchasing decisions through word-of-mouth. The role of social interaction and word-of-mouth deepens consumers' emotional dependence and loyalty to the brand, forming brand attachment.

6. DISCUSSION AND RECOMMENDATIONS

6.1 Summary of Research Findings

Through the study of the impact of user-generated content (UGC) on consumer brand attachment in cross-border e-commerce B2C platforms, this paper finds that UGC enhances consumers' engagement, trust, and sense of belonging, improves their brand awareness and emotional attachment, strengthens their brand loyalty and purchase intention, and forms brand attachment. As an emerging form of interaction, UGC is profoundly changing the relationship between consumers and brands, providing new ideas and methods for brand management and marketing strategies in cross-border e-commerce platforms.

6.2 Theoretical Hypotheses

Based on the findings of this study, the following theoretical hypotheses can be proposed: UGC enhances consumers' engagement, trust, and sense of belonging, improves their brand awareness and emotional attachment, strengthens their brand loyalty and purchase intention, and forms brand attachment. Future research can verify these theoretical hypotheses through empirical studies and case analyses, and further explore the mechanisms of UGC's impact on consumer brand attachment in different cultural backgrounds and market environments.

6.3 Recommendations for Brand Management and Marketing Strategies in Cross-Border E-commerce Platforms

Based on the findings of this study, cross-border e-commerce platforms can enhance consumers' brand attachment through the following strategies: First, platforms should encourage user-generated content, providing rich forms of interaction such as reviews, ratings, and shares, to enhance consumers' engagement. Second, platforms should ensure the authenticity and credibility of UGC through review and management mechanisms, enhancing consumers' trust. Third, platforms should promote the dissemination and

interaction of UGC through social media channels, enhancing consumers' sense of belonging. Finally, platforms should provide personalized recommendation services for consumers through big data and artificial intelligence technology, improving their shopping experience and brand attachment.

6.4 Future Research Directions

Future research can delve into the following aspects: First, empirical studies and case analyses can verify the theoretical hypotheses proposed in this paper, further exploring the specific impact mechanisms of UGC on consumer brand attachment. Second, multidisciplinary perspectives such as psychology and sociology can be combined to explore the mechanisms of UGC's impact on consumer brand attachment in different cultural backgrounds and market environments. Third, experimental studies and questionnaire surveys can be conducted to understand consumers' attitudes and behaviors towards UGC, providing theoretical support and practical guidance for brand management and marketing strategies in cross-border e-commerce platforms. Finally, big data and artificial intelligence technology can be used to analyze the content and dissemination patterns of UGC, providing data support and decision-making basis for brand management and marketing strategies in cross-border e-commerce platforms.

7. CONCLUSION

7.1 Main Research Findings

This paper explores the impact of user-generated content (UGC) on consumer brand attachment in cross-border e-commerce B2C platforms through literature review and theoretical analysis methods. The study finds that UGC enhances consumers' engagement, trust, and sense of belonging, improves their brand awareness and emotional attachment, strengthens their brand loyalty and purchase intention, and forms brand attachment. As an emerging form of interaction, UGC is profoundly changing the relationship between consumers and brands, providing new ideas and methods for brand management and marketing strategies in cross-border e-commerce platforms.

7.2 Theoretical and Practical Significance of the Research

This study not only enriches the theoretical research on cross-border e-commerce and UGC, providing a new perspective for understanding changes in consumer behavior, but also provides theoretical support and practical guidance for brand management and marketing strategies in cross-border e-commerce platforms. Through this study, cross-border e-commerce platforms can better utilize UGC to enhance consumers' brand attachment, promoting the sustainable development of the cross-border e-commerce industry. Future research can further explore the specific impact mechanisms of UGC on consumer brand attachment through empirical studies and case analyses, providing more theoretical support and practical guidance for brand management and marketing strategies in cross-border e-commerce platforms.

REFERENCES

[1] Wang Lin, He Yufeng, Yang Yong, et al. Case study on the promotion and inhibition factors of cross-border e-commerce brand attachment based on fsQCA [J]. Management Review, 2020, 32(12): 13.

[2] Liu Yingjun. Development and practice of new-form vocational training materials—Taking "Cross-Border E-commerce B2C Platform Operation" as an example [J]. Science and Technology Economy Market, 2023(6): 143-145.

[3] Qiao Huanhuan. Selection strategy of cross-border e-commerce B2C platform for small and micro enterprises [J]. Practice in Foreign Economic Relations and Trade, 2018(9): 4. DOI: 10.3969/j.issn.1003-5559.2018.09.008.

[4] Ji Xuejun. Analysis of the impact of B2C cross-border e-commerce platforms on China's foreign trade [D]. Capital University of Economics and Business [2024-07-27]. DOI: CNKI:CDMD:2.1016.077121.

[5] Wen Qiuhua, Wang Haigang. Discussion on the application of B2C cross-border e-commerce platform by China's small and medium-sized foreign trade enterprises [J]. Manager Journal, 2017(26): 284-285. DOI: CNKI:SUN:GLZJ.0.2017-26-244.

[6] He Ying. Comparative and selection analysis of B2C cross-border e-commerce export platforms for outward-oriented enterprises [J]. Market Modernization, 2017,

000(024):   28-30.   DOI: CNKI:SUN:SCXH.0.2017-24-017.

[7] Ye Zhenghao. Analysis of the impact of B2C cross-border e-commerce platforms on China's foreign trade—Taking Alibaba's Global as an example [J]. Knowledge Economy,   2018(2):   2.   DOI: 10.3969/j.issn.1007-3825.2018.02.043.

[8] Luo Jun. Analysis of techniques for preventing customer disputes under cross-border e-commerce B2C conditions—Taking Alibaba's Global platform as an example [J]. Practice in Foreign Economic Relations and Trade,   2017(8):   3.   DOI: CNKI:SUN:DWJW.0.2017-08-019.

[9] Qian Sha. Research on satisfaction evaluation of B2C import cross-border e-commerce platforms based on QFD [D]. Southwest Jiaotong University, 2020.

Analysis of the Influence of Emotional Education on Ideological and Political Education in Colleges and Universities

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Abstract: Ideological and political education is carried out based on the characteristics of students, which will bring about changes in their ideology and psychology, and has a positive significance for their growth and development. College students are at the age of passionate youth, with rich inner emotions. Therefore, the motivation of college students is influenced by their own emotions. There are many commonalities between emotional education and ideological and political education. Introducing emotional education into the ideological and political education of colleges can mobilize the enthusiasm of college students to learn, and has a more obvious effect on the effectiveness of ideological and political education. This paper will analyze the connotation, characteristics of emotional education and its impact on ideological and political education, and propose methods for applying emotional education to ideological and political education, in order to provide some reference for ideological and political education in colleges.
Keywords: Emotional Education; Higher Education Institutions; Ideological and Political Education; Influence

1. THE CONNOTATION OF EMOTIONAL EDUCATION

Emotional education, as an indispensable part of education, plays a crucial role in promoting the healthy development of students. It refers to teachers paying attention to students' emotions, moods, beliefs, and other aspects during teaching, providing positive guidance to students, enabling them to generate positive emotions and beliefs, making them happy physically and mentally, enlightening their thoughts and emotions. the ultimate goal of emotional education is to cultivate individuals.

In the process of cultivating individuals, teachers should guide students, help them form correct cognition, enable them to possess certain emotional regulation abilities, enable them to have positive emotional experiences in all aspects of life and learning, thereby forming a sound personality and achieving comprehensive development, so that they can become cultural workers with socialist consciousness in the future. Emotional education is related to human psychology. Therefore, teachers should pay attention to students' psychological characteristics during teaching, accurately analyze and grasp students' psychological characteristics, and carry out corresponding educational activities based on this.

2. THE NECESSITY OF INTEGRATING EMOTIONAL EDUCATION INTO IDEOLOGICAL AND POLITICAL COURSES IN COLLEGES AND UNIVERSITIES

2.1 Improving the Effectiveness of Ideological and Political Course Teaching

In the process of teaching ideological and political courses in colleges and universities, students have different emotional experiences, which often directly affect the quality of teaching. the content of ideological and political courses in colleges and universities is theoretically strong and profound. Integrating emotional education into the teaching of ideological and political courses can guide students to understand abstract knowledge points, apply theoretical knowledge to practical life, promote knowledge transfer, break through key and difficult points in teaching, and achieve teaching objectives. Emotional education, as an effective means of innovative teaching mode in colleges and universities, transforms abstract knowledge

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into easy-to-understand knowledge points, facilitates student understanding and repeated learning, promotes the effective development of teaching activities, thereby improving the quality of teaching and the effectiveness of ideological and political course teaching.

2.2 It Has a Certain Regulatory Role

In the ideological and political education in colleges and universities, it is necessary to carry out ideological and political education according to the psychological characteristics of college students and appropriately integrate emotional education. This has a positive effect on the improvement of college students' cognitive ability. If college students have positive emotions, they can have correct perceptions of things. Driven by positive emotions, it helps them form correct values, face things in life with the right mindset, treat problems in life with a kind heart. According to research, whether college students are emotionally positive or negative is related to their concentration and participation in ideological and political classrooms. If college students are happy and emotionally positive, their concentration and participation in the classroom will be higher, their cognitive ability for new knowledge will also be enhanced, they will be willing to learn and absorb new knowledge, and they can quickly understand the knowledge and content they have learned. If college students are emotionally negative, they will face learning and life with a negative attitude both in ideological and political classrooms and in their lives, automatically block relevant information, and the learning effect can be imagined. Therefore, the integration of emotional education into ideological and political education has a certain regulatory role for college students. According to students' psychological characteristics, conducting in-depth communication with students can influence their thoughts and behaviors, help them regulate their emotions, enhance their cognitive ability, and encourage them to actively participate in the study of ideological and political classrooms.

2.3 Enhance Students' Emotional Experience

The integration of emotional education psychology into this course is to enhance students' emotional experience, thereby creating a good learning atmosphere, promoting teacher-student cooperation and communication in the classroom, fundamentally changing the traditional way of teaching ideological and political courses, enhancing students' enthusiasm and initiative for learning, and ultimately achieving the goal of improving the quality of teaching ideological and political courses in colleges and universities.

3. APPLICATION METHODS OF EMOTIONAL EDUCATION IN IDEOLOGICAL AND POLITICAL EDUCATION IN COLLEGES AND UNIVERSITIES

3.1 Strengthen the Emotional Exchange between Teachers and Students

The ideological and political classroom in colleges and universities is usually carried out in a knowledge-imparting way, with a single teaching method, which will make college students who pursue fresh elements feel repulsed, thus rejecting its teaching method and the content of ideological and political education. In order to implement and fulfill emotional education in the ideological and political classroom, teachers should first abandon the theoretical knowledge-imparting teaching method and build an interactive classroom teaching mode. In the ideological and political classroom, strengthen the emotional exchange with college students, achieve effective interaction with college students, understand their actual emotions, and use this as a starting point to introduce relevant ideological and political knowledge, so that college students can have a deeper understanding of ideological and political knowledge, improve the quality of ideological and political education, and let the ideas and concepts under ideological and political education penetrate into the hearts of college students.

3.2 Ideological and Political Teachers Need to Find the Right Ideological Orientation

In the actual teaching process, schools and teachers must find the right ideological orientation of emotional education psychology in the teaching process through various ways. They need to deeply understand the importance of emotional education psychology from the bottom of their hearts,

laying the foundation for the application of emotional education psychology in ideological and political courses. For example, some universities carry out theme reports in the teaching process to enhance teachers' understanding of the importance of emotional education psychology in teaching, fully discuss it, and analyze and summarize it with practical teaching examples. In addition, some universities also launch regular teaching and research exchange activities, allowing teachers of different positions to exchange and share experiences, constantly enriching the methods and skills used by teachers in applying emotional psychology in teaching. In addition, some schools actively cooperate and communicate with other institutions to promote the development of ideological and political courses, promote the innovation of teachers' ideological concepts, promote the application of emotional education psychology in ideological and political education courses, thereby improving the overall teaching quality of ideological and political courses.

3.3 Use the Internet to Build a Platform for Emotional Exchange between Teachers and Students

The development of the Internet and information technology has made it possible for immediate emotional exchange between teachers and students. the integration of emotional education into ideological and political education is not limited to the classroom but should also be reflected in the lives of college students. In the new era, teachers can use information technology tools to build a platform for emotional exchange with college students, achieving convenient communication with college students. Teachers can establish emotional exchange WeChat groups with college students, post socially significant events or events in life that are educationally meaningful in the group, analyze the reasons for such events with college students, discuss their views on such events, understand the value orientation behind such events among college students, and achieve in-depth communication with college students. In interaction and discussion, teachers can inspire positive emotions in college students, cultivate their correct values, and enable college students to possess the

ideological and political qualities required by ideological and political education.

3.4 Stimulate the Persuasive Power of Ideological and Political Theory Courses

Social practice as an extension of ideological and political course teaching can help students further understand theoretical knowledge while enhancing their emotional experience. Practice is an important way to test learning effects. To deeply understand the essence of ideological and political course knowledge, it is necessary to conduct teaching practice. Only by combining theory with practice can we help students establish correct worldviews, outlooks on life, and values, achieving the goal of combining knowledge with action. Firstly, colleges and universities should increase the construction and management of nurturing practice bases and platforms, carry out diverse teaching practice activities, so that students can learn happily in practice. At Simultaneously, teachers should correctly treat the relationship between theoretical teaching and practical teaching, coordinate their internal connections, combine students' individualized development characteristics, and innovate teaching contents. Based on emotional education, construct a practical teaching mode, realize emotional sublimation in combining theory with practice, through strengthening emotional interaction between teachers and students, let students deeply experience and perceive theoretical knowledge of ideological and political courses through practice.

4. CONCLUSION

In summary, taking students as the basis and returning to human existence itself has become the ultimate value pursuit of education. How to unify individual development and social development of students, fully use emotional education to respond to students' emotional demands and value concerns, and enhance the effectiveness of colleges and universities in fostering morality and character requires continuous research and exploration by educators in ideological and political work at colleges

REFERENCES

[1] P. Lang, Fan Guorui. International Perspective on Emotional Education [J].

Journal of East China Normal University (Educational Science Edition), 1995(03):39-40.

[2] Zhu Xiaoman. Theoretical Development and Practical Course of Emotional Education [J]. Journal of Suzhou University (Educational Science Edition), 2015(4):145-146.

[3] Zhang Shuyan. Contemporary Realistic Thinking on Emotional Education in China [D]. Changchun: Northeast Normal University, 2008(9):52-53.

[4] Rui Hongyan. Value Implication and Practical Path of Affinity in Moral Education in Colleges and Universities [J]. Jiangsu Higher Education, 2018(01):161-162.

Common Issues and Strategies for Cultural Adaptation among International Students in China

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Abstract: The author takes the international students in China as the research object, study the adaptation status from the aspects of language barriers, cultural differences, educational methods, interpersonal communication, social network support, confusion of Identity recognition, alienation in interpersonal interaction and so on and explores the differences and influencing factors affecting adaptation, and finally puts forward the corresponding solutions.
Key words: Cultural Adaptation, International Students, Issues And Strategies

1. INTRODUCTION

With the continuous enhancement of China's comprehensive national strength and international influence, more and more foreign students choose to study in China. How to help these foreigners adapt more quickly to China's education, life, and other aspects requires more attention and research on the issue of cultural adaptation.

Cultural adaptation is a dynamic process. International students in China will encounter pressure, make adjustments, and then try to move forward in the process of adapting to Chinese culture. the biggest challenges the international students usually encounter in the process of cultural adaptation including language barriers, cultural differences, the establishment of social support networks, confusion about identity recognition and academic pressure, etc.

2. LANGUAGE BARRIERS

Language is the foundation of cross-cultural adaptation. International students in China often face difficulties in language communication, especially for students from non-English speaking countries, learning Chinese is a challenge. the diversity of Chinese dialects also increases the difficulty of language learning. Taking the College as an example, more than 70% of students come from the Arab country of Morocco, and there are also students from Russia, Cambodia, Bangladesh, Cameroon, etc., and the vast majority are zero-based students, first facing the challenge in the language aspect. International students may encounter difficulties in language communication because there are significant differences between Chinese and their mother tongue in terms of grammar, pronunciation, and expression habits, which increases the difficulty of learning and life.

3. CULTURAL DIFFERENCES

Chinese traditional culture, social customs, and values may be completely different from the countries where the students come from, bringing them a lot of confusion and adaptation issues. For example, Chinese people value collectivism and family concepts, while some Western students emphasize individualism and freedom more. Most international students lack an in-depth understanding and recognition of the deep values and spiritual core of Chinese culture, and cannot resonate with Chinese thoughts such as loyalty, filial piety, integrity, and honesty. In addition, Chinese food culture is different from many countries, including the taste of food, cooking methods, and dining habits, etc. International students may need time to adapt to these differences.

4. EDUCATIONAL METHODS

Chinese teaching methods and classroom interaction patterns may be different from the students' home countries, and they may need time to adapt to the teacher-led teaching style. For example, when Chinese teachers interact in the classroom, if students answer

incorrectly, they often smile to avoid students being nervous, which can lead to students misunderstanding the teacher, thinking that Chinese teachers are mocking and ridiculing them.

5. SOCIAL SUPPORT NETWORK

The social support network is a crucial element that significantly impacts the well-being and mental health of international students who find themselves immersed in a new and different cultural environment. When students leave their home countries to study abroad, they often leave behind a familiar support system of friends, family, and community connections that have been instrumental in their emotional and psychological stability. It plays an important role in alleviating the tension of international students in a different culture. International students in China need to rebuild the social support network, but many students show a more serious lack in this aspect.

6. CONFUSION OF IDENTITY RECOGNITION

Cultural identity is a fundamental aspect of an individual's sense of self, shaped by one's upbringing, traditions, values, and societal norms. For international students studying in a foreign culture, the process of identity recognition can become a complex and challenging journey. This confusion is not merely a fleeting emotion but a deep-seated struggle that affects various facets of their lives, from their academic pursuits to their personal relationships and mental well-being. In a foreign culture, international students may have uncertainty about cultural identity, feeling confused. They may experience a "marginal person" status, feeling that they can neither firmly believe in the various truths in the original culture, nor truly integrate into the life of the new cultural group.

7. ALIENATION IN INTERPERSONAL INTERACTION

Feeling alienated in interpersonal interactions is a common challenge that international students often face when navigating the complexities of a new cultural and linguistic landscape. This sense of isolation can stem from various factors, including cultural misunderstandings, language barriers, and the inherent differences in social norms and

expectations. Due to the above reasons, some international students may feel unable to integrate into the local culture, leading to a sense of alienation in interpersonal interactions.

International students can improve their adaptability by strengthening language training, actively learning cross-cultural knowledge, improving cross-cultural adaptability, changing the concept of face, and establishing a social support network.

8. LANGUAGE LEARNING AND TRAINING

Language learning and training is an important part to help international students better adapt to their study and life in China. By providing professional Chinese language learning or training courses, students can systematically master the basic knowledge and practical skills of the Chinese language. In these courses, teachers usually use a variety of multimedia tools, such as PPT slides, video and audio materials, to enrich the teaching content and make the learning process more intuitive and interesting. These tools can not only help students to better understand and remember Chinese vocabulary and grammar rules, but also provide a real language environment, so that students can feel the actual use situation of the language.

In addition, in order to improve students' practical language application ability, teachers will organize various interactive activities, such as role-playing and situational dialogue. These activities simulate various scenarios that may be encountered in daily life, such as shopping, ordering food, asking for directions, seeking medical treatment, etc., and let students practice language communication in the simulated situation, and enhance their language response ability and communication skills. Through this practical learning, students can improve their Chinese proficiency in a relaxed and happy atmosphere. At the same time, in order to meet students' language needs in the academic field, the course will also cover the study of academic Chinese, such as the explanation of professional terms, writing guidance of academic papers, speech skills of academic reports, etc. This helps students to become more confident and professional in academic

research and academic exchanges.

In addition to classroom teaching, it will also provide opportunities for language practice, such as language corners, cultural salons, and language partner programs, allowing students to communicate with native Chinese in an informal environment to further improve language fluency and cultural comprehension. In short, through these well-designed language learning and training courses, students can not only improve their Chinese language skills, but also better integrate into the daily life and academic environment in China, laying a solid language foundation for their overseas study life and future career development.

9. CULTURAL EDUCATION

Universities by opening students orientation, China, Chinese culture and other related courses or seminars, and to help students understand Chinese history, tradition, social customs and values, promote students have a more comprehensive understanding of Chinese culture and accept, do cross-cultural, can through the combination of classroom teaching and extracurricular experience, provide students with more diversified contact with Chinese culture, enhance their affinity to Chinese culture and communication ability. Here are some examples of specific cultural experiences:

9.1 Visiting Ethnic Culture Museums: International students visit places such as the Heilongjiang Provincial Ethnic Culture Museum to learn about the excellent cultures and traditions of different ethnic groups in China, appreciating ethnic customs and cultural connotations.

9.2 Experiencing Chinese Traditional Festivals: During the Spring Festival, international students participate in traditional activities such as pasting couplets, making lanterns, and making dumplings, fully experiencing Chinese New Year customs and flavors.

9.3 Learning Traditional Chinese Handicrafts: International students engage in practical activities like writing Chinese characters, making dumplings, and learning paper-cutting, deeply experiencing Chinese traditional culture, improving their Chinese language expression skills, and understanding the related cultural backgrounds and stories in the process.

9.4 Calligraphy and Paper-cutting Art Experience: Under professional guidance, international students learn the basic skills of calligraphy and paper-cutting art, feeling the charm of Chinese traditional culture.

9.5 Visiting Museums and Cultural Exhibitions: By visiting cultural venues such as the Dalian Museum, international students learn about Chinese historical culture and the exchange and integration of different cultures.

9.6 Participating in Photography Exhibitions: International students record the moments of their life in China through photography, reflecting their interest and love for Chinese culture.

9.7 Chinese Culture Experience Courses: Universities in Guizhou offer Chinese culture experience courses for international students, which include content such as traditional festivals, handicrafts, sports, and food culture.

9.8 Diversification of Teaching Venues and Methods: According to different cultural experience courses, the choice of teaching venues is diversified, including specialized classrooms, outdoor venues, etc., emphasizing immersive teaching and students' personal experiences.

10. SOCIAL ACTIVITIES

Social activities are an indispensable part of international students 'overseas life. They can not only enrich students' campus life, but also promote the communication and understanding between students from different cultural backgrounds. Many universities attaches great importance to providing a variety of social activities and festivals for international students to help them better integrate into the local society and enhance their understanding and experience of Chinese culture.

By organizing various social activities, such as cultural festivals, international food festivals, campus parties, and sports events, universities encourage international students to interact with Chinese students and other international students. These activities not only provide students with the opportunity to show their own cultural characteristics, but also give them the opportunity to understand and experience other cultures, thus promoting

cross-cultural communication and the establishment of friendships.

In order to deepen the international students' understanding of Chinese culture, some universities have established a three-level cultural experience activity system, including school culture, urban culture and Chinese culture. This system provides a full range of cultural experience opportunities for international students through the combination of after class and out of school. For example, the school introduces Chinese history and culture in class, organizes students to visit various museums and historical relics after class, or participate in local cultural activities.

In addition, many universities also organize celebrations during important traditional Chinese festivals, such as making zongzi on the Dragon Boat Festival, making mooncakes on the Mid-Autumn Festival, and making dumplings in the New Year, so that students can personally participate in these traditional customs. These activities not only allow the international students to experience the happy atmosphere of Chinese festivals, but also enable them to have a deeper understanding of the cultural significance and historical stories behind these festivals.

Furthermore, many schools also regularly hold fraternity meetings, cultural exchange salons, etc., to provide a relaxed and happy social environment for overseas students, so that they can improve their language ability and cultural adaptability through communication with others. Through these activities, international students can not only make new friends, but also broaden their horizons and enhance their understanding of different cultures.

In short, by organizing a variety of social activities and festivals, many university provides a platform for the students to deeply understand and experience Chinese culture, help them find a sense of belonging in foreign countries, and also lay a good foundation for their future cross-cultural exchanges and international cooperation.

11. MENTOR SYSTEM

It is an effective educational management mode in higher education, and plays a vital role especially in the education of international students. By providing each international student with academic or life mentors, universities can provide more personalized and detailed guidance and support to help students better adapt to their abroad life and achieve academic and personal growth. Mentors are typically responsible for the following aspects:

11.1 Academic Guidance: Mentors provide academic guidance to international students, helping them understand course content and guiding academic research and the writing of theses.

11.2 Language Support: Although language courses are the responsibility of language teachers, mentors also assist international students in improving their Chinese language proficiency in academic exchanges, especially in the use of professional terminology.

11.3 Cultural Adaptation: Mentors help international students understand Chinese culture and social customs, promoting better integration into local life.

11.4 Life Counseling: Mentors offer counseling and advice on life matters, assisting international students with potential issues in accommodation, dining, transportation, etc.

11.5 Mental Health: Pay attention to the mental health of international students, providing psychological support and guiding them to seek professional psychological counseling services when necessary.

11.6 Career Planning: Mentors assist international students with career planning, providing information on internship opportunities and helping them understand career paths.

11.7 Social Networking: Mentors help international students build professional and social networks, introducing them to peers and industry experts.

11.8 Regulations and Policies: Explain the school's regulations and policies to international students, ensuring they understand and comply with institutional rules.

11.9 Emergency Handling: In case of emergencies, mentors are the first point of contact for international students seeking assistance.

11.10 Cross-Cultural Communication: Mentors facilitate communication between international students and Chinese students as

well as other international students, enhancing mutual understanding.

11.11 Academic Integrity Education: Educate international students on adhering to principles of academic integrity to prevent academic misconduct.

11.12 Feedback and Assessment: Mentors assess the academic progress and adaptation of international students through regular communication and feedback, offering suggestions for improvement when necessary. After a comprehensive review of the challenges faced by international students in cultural adaptation, we can conclude that these challenges are multidimensional and intertwined. These challenges may have profound effects on their academic performance, social life, and mental health. Through the implementation of the above strategies, we expect the international students to grow and progress in the process of cultural adaptation, and finally gain a rich and meaningful experience in the life of studying abroad in China. This is not only a support for individual students, but also a strong promotion for the internationalization of China's higher education. Through our joint efforts, the students studying in China will be able to find their own place in this vibrant land and realize their dreams and aspirations.

REFERENCES

[1] Berry, J. W. (2005). Acculturation: Living successfully in two cultures. International Journal of Intercultural Relations, 29(6), 697-712.

[2] Zhou, Y., Jindal-Snape, D., Topping, K., & Todman, J. (2008). Theoretical models of culture shock and adaptation in international students in Britain: A critical review. Educational Research Review, 3(2), 49-60.

Development of Multi zone Thermocouple Calibration Furnace

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Abstract: This article analyzes the main problems of thermocouple calibration equipment at home and abroad. A multi zone thermocouple calibration furnace is designed, which achieves independent temperature control in multiple zones through segmented arrangement and segmented control of heating wires. At the same time, the furnace barrel and active heat dissipation device are designed. A closed-loop feedback control system is composed of embedded temperature control thermocouples, potential acquisition boards, controllers, etc. A high-precision temperature control system and human-computer interaction system are designed to achieve calibration of various thermocouples.
Keywords: Thermocouple calibration; Multi zone heating; Independent temperature control; Control system

1. RESEARCH SIGNIFICANCE

Thermocouples have a wide range of applications and important roles in the field of temperature measurement. Thermocouples can measure temperatures from extremely low to extremely high, typically ranging from -200 ℃ to 1300 ℃, and in special cases up to -270 ℃ to 2800 ℃ [1]. Thermocouples are used in industrial production processes to monitor and control the temperature of furnaces, reactors, and other equipment, ensuring the stability of the production process and product quality. According to national requirements, thermocouples need to undergo regular calibration and verification. the performance of the calibration furnace determines the accuracy of its calibration results. Therefore, developing a high-precision thermocouple calibration furnace is of great significance.

2. THE STATUS QUO AT HOME AND ABROAD

With the continuous advancement of industrial automation and temperature measurement technology in China, thermocouple calibration equipment has also made significant progress. There are various types of thermocouple calibration equipment available in the domestic market, including portable, desktop, and high-precision automated calibration systems. These devices have achieved a high level of measurement accuracy, stability, and ease of operation. However, there are still many problems. Firstly, the isothermal zone of existing calibration equipment is too short, and it comes into direct contact with air at the furnace mouth and other parts, resulting in significant heat loss and a shorter uniform temperature zone for calibrating equipment [2]. Secondly, the indicators deteriorate when fully loaded. There are multiple thermocouples in the furnace at full load, resulting in an increase in thermal conductivity and strong axial heat conduction, which affects the axial temperature field indicators; the third issue is the existence of temperature field offset and high-temperature leakage phenomena, which can lead to a decrease in the insulation strength of furnace tube materials in high-temperature environments, affecting the stability of thermal power and causing leakage phenomena. Therefore, it is urgent to develop a thermocouple calibration furnace with sufficient isothermal zone length, stable full load performance, and anti leakage function.

3. OVERALL DESIGN OF MULTI ZONE HIGH-TEMPERATURE FURNACE

3.1 Working principle

The verification and calibration furnace provides a constant temperature environment in the thermocouple verification and calibration process. the main principle is to create a constant temperature environment for

thermocouple verification and calibration in the furnace. This equipment mainly uses heating wires to provide heat, and through a three-stage method, increases the length of the constant temperature field, and uses insulation materials and structures to reduce heat loss. By using temperature control software to control the heating wire and cooling fan, temperature control of the temperature field can be achieved.

3.2 Thermal analysis of furnace tube

In terms of the relationship between temperature and heat transfer process, heat transfer can be divided into steady-state heat transfer process that does not change with time and transient heat transfer process that changes with time. There are three basic ways of heat transfer: conduction, convection, and radiation [3]. the heat transfer principle of the verification furnace: During the working process, a stable dynamic balance is achieved between the heat generation and heat dissipation inside the furnace cylinder, so that the temperature inside the furnace cylinder remains stable and unchanged.
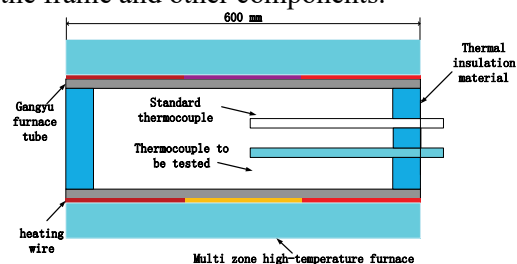
Thermal convection refers to the common convective heat transfer process caused by the relative displacement between different parts of a fluid (liquid or gas) due to macroscopic motion, resulting from the mixing of cold and hot fluids. Thermal conduction refers to the process of transferring heat from the high-temperature part of an object to the low-temperature part, or from a high-temperature object to a low-temperature object in contact with it. It is achieved through the thermal motion of microscopic particles such as molecules, atoms, and free electrons inside the material [4]. Inside an object, the intensity of thermal motion of microscopic particles varies with different temperatures. the particles in the high-temperature area have intense thermal motion and high energy. They collide with particles in the low-temperature area, transferring energy to the particles in the low-temperature area, thereby conducting heat from the high-temperature part to the low-temperature part. Any object with a temperature above absolute zero will continuously radiate electromagnetic waves outward. the higher the temperature of an object, the greater the energy radiated, and the shorter the wavelength of electromagnetic

waves. When electromagnetic waves of thermal radiation are irradiated onto other objects, they will be absorbed, reflected, or transmitted by the objects. the absorbed part will raise the temperature of the object, thereby achieving heat transfer [5].

The temperature field environment inside the multi zone high-temperature furnace is complex, with phenomena such as heat conduction, convection, and radiation. the furnace tube and heating wire mainly conduct heat, while there are phenomena such as convection and radiation between the furnace tube and the air inside the furnace tube. Whether it is heat conduction, heat convection, or heat radiation, the principle of energy conservation must be followed, and a multi zone high-temperature furnace should be designed based on the law of energy conservation and energy control equations.

3.3 Overall scheme design

The overall design of the multi zone high-temperature furnace is shown in Figure 1, which mainly includes the furnace tube, shell, baffle, frame, base, air duct, dust net, etc. the furnace tube is the core of the entire calibration furnace, mainly responsible for the formation of the temperature field; the air duct is responsible for rapidly cooling the furnace tube, facilitating the start of a new round of calibration work, and improving the overall efficiency of the machine. the frame is the support of the entire device, and all components of the calibration furnace are installed on the frame to form a whole. the base is the installation part of the main electrical components, providing support for the frame and other components.

The furnace requires a temperature field environment of 100-1200 ℃. the heating device uses heating wires as the heat source and corundum tubes made of high-purity alumina as the furnace tubes. the furnace tubes are shown in Figure 2. the long-term use temperature can reach 1600 ℃, and the short-

term maximum use temperature can reach 1800 ℃. the water absorption rate is below 0.01-0.02%, and the Mohs hardness reaches level 9. It can maintain good physical and chemical properties in high temperature environments, and is not easy to soften, deform or crack; By winding a heating wire around a corundum tube, the corundum tube is heated. the air inside the tube is heated by convection heat transfer and heat radiation, forming a uniform temperature field inside the corundum tube. Heating wire materials are mainly divided into two categories: metal and non-metal. Common metal heating materials include nickel chromium alloy (nickel chromium iron alloy) and iron chromium aluminum alloy. Nickel chromium alloys are usually divided into binary alloys and ternary alloys. Iron is also present in binary nickel chromium alloys, with a mass fraction of about 0.5-3%. Iron chromium aluminum alloys are used as heating wires, with a maximum heating temperature of 1800 ℃. Iron chromium aluminum alloy heating wires have good temperature resistance at high temperatures, stable composition, and good ductility as metals. the specific shape of the heating wire can be adjusted during processing; Arrange insulation cotton outside the corundum tube, with insulation cotton arranged in sections and thickened at the furnace mouth to slow down heat dissipation and increase the length of the uniform temperature field [6]. the insulation cotton is made of ceramic fiber insulation cotton, which can be used for a long time at high temperatures of 1000-1300 ° C. It has the characteristics of softness, elasticity, and easy processing and shaping, and can be made into various shapes of insulation products according to the shape and requirements of the high-temperature furnace; In order to achieve rapid cooling of the furnace barrel during calibration, an active cooling device was designed to achieve rapid cooling of the furnace barrel. the fan used is a DC fan, mainly composed of a motor, impeller, housing, and other parts. the motor is driven by a DC power supply, which drives the impeller to rotate and generate airflow. When the DC current passes through the coil of the motor, a magnetic field is generated, which interacts with the permanent magnets in the

motor, causing the rotor of the motor to rotate. the rotation of the rotor drives the impeller to rotate, and the rotation of the impeller drives the flow of air, thereby generating airflow. During the design process, efforts were made to minimize the volume and weight of the furnace body. Special furnace tubes and tube supports were designed, and the shape of the furnace tube was optimized. Based on this, a well ventilated shell and frame were designed to complete the overall structural design of the machine.

Figure 2: Jadeite Furnace Tube

4. CONTROL SYSTEM DESIGN

The hardware part of the temperature control system for this calibration furnace consists of five modules: data acquisition, communication, temperature control center MCU, output control, and touch screen. the touch screen system uses the Diwen Technology industrial capacitive touch screen, which works at a voltage of 5-12V and has self-developed main software, 256MB (expandable to 1GB, 2GB) Flash memory, 56K variable space 8-channel curve trend chart memory, and extremely fast (up to 80ms) variable response speed. It can conveniently and quickly drag controls, select parameters, easily display temperature curves, temperature set values, and current value parameters, and has an excellent human-machine interaction interface [7].

The multi zone high-temperature furnace adopts a three zone temperature control method, in which three heating wires are wound around the furnace tube separately. Each heating wire is individually controlled, and the temperature of each heating wire is adjusted in real time according to the temperature inside the furnace. Then, the temperature inside the furnace tube can reach the set range. When the temperature range is reached, due to convective heat transfer and

thermal radiation at the furnace tube mouth, the air temperature inside the furnace tube will fluctuate within a certain range. At this time, precise temperature control is required. A closed-loop feedback control system is composed of embedded temperature control thermocouples, potential acquisition boards, controllers, etc. the embedded temperature control thermocouples are installed inside the furnace tube, and the potential signals generated by them are transmitted to the microcontroller control system through the potential acquisition board to control it. the system compares the measured value with the set value and then transmits the error to the PID controller, Thus driving the heating wire to work, increasing or decreasing its working power, the control principle is shown in Figure 3. When the high-temperature furnace completes its work, the speed of the fan in the cooling system can be adjusted to achieve rapid cooling of the entire machine. In addition, the control system communicates with the touch screen through 485 communication, allowing users to adjust the temperature setting value and intuitively read the current furnace temperature, heating wire power, and so on.
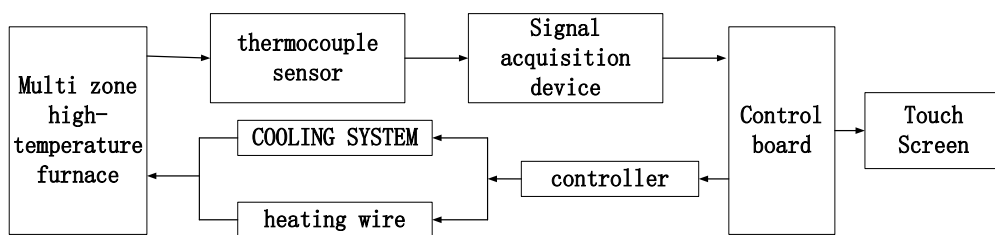

Figure 3. Control schematic diagram

the temperature sensor inside the furnace adopts a thermocouple sensor to obtain the temperature in real time. the controller receives the signal from the temperature sensor and adjusts the heating power of the high-temperature furnace according to the preset control algorithm to achieve precise temperature control. After reaching the set temperature, the heating power can be automatically adjusted to maintain temperature stability while reducing energy consumption. the control system can also automatically adjust the power output according to the actual load situation, further improving energy utilization efficiency [8]. This design adopts adaptive fuzzy PID, which combines the advantages of fuzzy logic and traditional PID control, and has strong adaptability and robustness. By defining fuzzy rules, the error and error change rate are fuzzified to obtain fuzzy input variables. Then, according to the fuzzy rules, inference is carried out to obtain fuzzy output variables, that is, the adjustment amount of PID parameters. Finally, the fuzzy output variables are converted into accurate PID parameter adjustment values through defuzzification. In the adaptive fuzzy PID control system, the deviation e is obtained by subtracting the original temperature from the actual temperature, and the change rate of the deviation over time is recorded as the deviation rate ec. the values of e and ec are input into the controller, and as the production situation changes, the speed deviation and deviation rate will change. For the speed controller, it is necessary to Real time update of e and ec values. Then, using the principle of fuzzy control, adjust the outputs $\triangle$ Kp, $\triangle$ Ki, and $\triangle$ Kd of the fuzzy controller, and finally adaptively adjust the controller parameters $\triangle$ Kp, $\triangle$ Ki, and $\triangle$ Kd to complete the control task [9].

5. SUMMARY

This article analyzes the current situation and problems of thermocouple calibration equipment at home and abroad, proposes a multi zone thermocouple calibration furnace, designs a multi zone heating device through segmented arrangement and segmented control of heating wires, and provides a detailed introduction to key components such as alumina tubes, insulation cotton, and cooling fans. the control system is the core of the thermocouple calibration furnace, which adopts a three-stage independent control and a well-designed human-machine interaction system to meet the calibration needs of various

thermocouples.

REFERENCES

[1] Wang Zhe, Yu Songlin, Wang Xiaodan. Design and Development of Continuous Thermocouple Calibration Furnace [J]. Automation and Instrumentation, 2024, 39(03):117-120+159

[2] Sun Ruo, He Xiaohui, Zhang Jun. Design of an Intelligent Thermocouple Automatic Calibration System [J]. Metrology and Testing Technology, 2023, 50(03):1-4

[3] Yu Shaoying. Progress in the Application of Thermocouple Calibration Furnace [J]. Instrumentation User, 2022, 29(09):99-102

[4] Liu Hongyan, Zhang Shuaixing, Xu Zhenzhen, et al. Temperature Field Study of Multi zone Heating Thermocouple Calibration Furnace [J]. Journal of Metrology, 2022, 43(02):228-234

[5] Yu Fan. Design and Experimental Study of Multi temperature Zone Tube Thermocouple Calibration Furnace [D]. Shandong Agricultural University, 2021

[6] Li Guqiao. Discussion on Common Problems of Thermocouple Automatic Calibration System [J]. Automation and Instrumentation, 2020, (10):165-167

[7] Xu Fangpeng. Design and Temperature Field Characteristics Study of High Precision Constant Temperature Bath [D]. Shandong Agricultural University, 2019

[8] Xie Y, Cui Y, Wang H, et al. Research on a dedicated thin-film thermocouple testing system for transient temperature measurement [J]. Measurement Science and Technology, 2024, 35(8):

[9] Cheng Lei, Zhao Wentao, Zhu Junjie, et al. Study on the Performance of Thermocouple Calibration Furnace Temperature Field Based on COMSOL [J]. Journal of Metrology, 2024, 45(06):842-847

Vehicle Detection Based on Improved Inter Frame Difference Method

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Abstract: There are difficulties in efficient real-time detection of moving vehicles, such as missing target contours, holes inside the target, and inability to update the background in real time. Based on this, an improved three frame differential fusion algorithm is proposed, which applies the improved three frame differential method to solve the problem of incomplete target contours and perform motion vehicle detection. Experimental results have shown that the proposed algorithm can effectively solve the problem of missing contours of moving targets.

Keywords: Three-frame difference method; moving vehicle detection

1. INTRODUCTION

In recent years, the detection of moving targets, especially moving vehicles, has developed and been widely applied. Moving object detection is the process of detecting moving objects from a sequence of images. At present, there are three main methods for detecting moving targets: background subtraction, inter frame subtraction, and optical flow [1]. This article conducts real-time detection of moving vehicles in dynamic scenes in videos, solving the problems of missing target contours and inability to update backgrounds in real time [2]. This article proposes an improved algorithm that combines the three frame difference method with the background difference method.

2.. FRAME DIFFERENCE METHOD
2.1 Two frame difference method
The inter frame difference method is a detection method proposed based on the strong correlation between adjacent frames in a moving image sequence [3]. This detection method is insensitive to changes in lighting and is very suitable for dynamic environments. It has simple operation, fast detection speed, accurate vehicle positioning, and is suitable for scenes with high real-time requirements. The basic principle of the traditional frame difference method, namely the two frame difference method, is as follows:

$$G_k(x,y) = |P_k(x,y) - P_{k-1}(x,y)| \qquad (1)$$

Due to the continuity of video images captured by cameras, if there are no moving objects in the scene, the changes between consecutive frames are very weak, while if there are moving targets, the changes are more obvious [4]. the two frame difference method algorithm is simple and less affected by lighting, but it still has the following drawbacks: firstly, it cannot detect stationary or slow-moving objects, and for high-speed moving objects, the segmentation area will be much larger than the real target, and its segmentation area is related to the target's motion speed [5]; Secondly, if the grayscale inside the object is relatively uniform, adjacent frame differences may form voids in the overlapping parts of the target, which can lead to disconnected segmentation results and hinder further object analysis and recognition [6].

Therefore, this article proposes an improved three frame difference method to solve the problems existing in traditional frame difference methods.

2.2 Three frame difference method
When the target object moves too fast, the image obtained by the two frame difference method will have problems such as ghosting and the target area being too large [7]. Therefore, the three frame difference method is proposed to improve the image processing effect. the basic principle is to improve the method of obtaining the result image using two frames to use adjacent three frames for object detection.

Firstly, obtain the difference maps between the k-th frame and the k-1st frame, as well as the difference maps between the k+1th frame and

the k-th frame. Then, convert the grayscale image into a binary image, and finally perform an AND operation on the obtained binary difference maps to obtain the final result.

The formula principle is as follows:

$$G_k(x,y) = |P_k(x,y) - P_{k-1}(x,y)| \cap |P_{k+1}(x,y) - P_k(x,y)| \quad (2)$$

The selection of threshold T is very important in the inter frame difference method. If the threshold T selected is too small, it will not be able to suppress noise in the differential image; If the threshold T is chosen to be too large, it may also mask some information about the target in the differential image; Moreover, a fixed threshold T cannot adapt to changes in lighting in the scene [8].

In order to make the difference between the motion target and the background more prominent, the maximum inter class variance method (also known as Otsu algorithm) is used to achieve this goal [9]. This algorithm is derived based on the grayscale histogram using the principle of least squares, and has statistical significance for optimal segmentation [10]. Its basic principle is to divide the grayscale value of an image into two parts using the optimal threshold, so that the variance between the two parts is maximized, that is, it has the maximum separability.

2.3 Improve the three-frame difference method

Due to the difference method between three frames, the resulting image often has issues such as internal voids and missing contour parts. This article proposes an improved three frame differencing method, which uses the Laplacian operator with high boundary localization accuracy, strong anti-interference ability, and good continuity to detect the edges of the k-th frame image [11]. Then, the effect image of the three-frame differencing method is compared with the edge image of the k-th frame through an "AND" operation to obtain the improved three frame differencing method effect image.

The improved three frame difference algorithm is as follows:

Firstly, using the traditional three frame difference method mentioned above, the difference maps between the k-th frame and the k-1st frame, as well as the difference maps between the k+1th frame and the k-th frame, are obtained. the grayscale image is then converted into a binary image, and the obtained two frame difference maps are subjected to an "AND" operation to obtain the binary image of the traditional three frame difference method. Secondly, using the Laplacian operator for edge detection on the k-th frame image essentially highlights the edges of the image.

Due to the fact that Laplacian is a differential operator with rotational invariance, its application can enhance areas of sudden grayscale changes in images and weaken areas of slow grayscale changes [12]. Therefore, sharpening processing can choose the Laplacian operator to process the original image, producing an image that describes the sudden grayscale changes, and then overlay the Laplacian image with the original image to produce a sharpened image. the basic method of Laplace sharpening can be represented by the following equation:

$$\nabla^2 f = \frac{\partial^2 f}{\partial x^2} + \frac{\partial^2 f}{\partial y^2} \quad (3)$$

Its approximate expression is:

$$\nabla^2 f(x,y) = f(x+1,y) + f(x-1,y) + f(x,y+1) - 4f(x,y) \quad (4)$$

Finally, by performing an "AND" operation on the obtained three frame difference method effect image and the k-th frame Laplacian edge map, the improved three frame difference method binary image proposed in this paper is obtained.

3. ALGORITHM RENDERING
3.1 The rendering of the three-frame difference method

(a)Difference graph of k frame and k-1 frame

(b)Difference graph of k+1 frame and k frame

(c)Binary image of three-frame difference method

Fig. 1 Image of three-frame difference method

3.2 Post processing

In order to make the contour of the binary image of the moving target clearer and remove internal holes, it is necessary to perform post-processing on the binary image obtained by the algorithm in this paper.

Perform mathematical morphological filtering on the obtained binary graph, using dilation algorithm to solve this problem. Expansion is the process of merging all background points in contact with an object into the object, causing the boundary to expand outward. By expanding, small holes in the image and small depressions at the edges of the image can be filled.

$$A \oplus B = \left\{ x : B_x \cap A \neq \varnothing \right\} \qquad (5)$$

4. CONCLUSION

This article uses an improved three frame difference method to solve the problems of missing object contours, holes inside the target, and missing targets when the speed is too slow in traditional frame difference methods. the algorithm in this article can effectively suppress noise in video images through preprocessing, and use algorithm fusion to eliminate target holes, complete target contours, and achieve real-time background updates, achieving good object detection results during vehicle motion.

REFERENCES

[1] Luo Min, Liu Dongbo, Wen Haoxuan, et al. Vehicle motion target detection based on background difference method and inter frame difference method [J]. Journal of Hunan University of Engineering (Natural Science Edition), 2019(4):58-61

[2] Chen Yuan, Hu Na, Yu Qiuyue. Motion Object Detection by Integrating Background Difference Method and Frame Difference Method [J]. Modern Computer, 2019(34):50-53

[3] Chen Ning, Chen Benjun. Motion Object Detection Method Based on Differential Method and Contour Filling [J]. Journal of Zhejiang University of Science and Technology, 2019(5):387-391

[4] Zhou Wenjing, Chen Wei. Target tracking algorithm based on improved inter frame difference and local Camshift [J]. Software Guide, 2018(3):67-70

[5] Liu Xin, Jin Yanghong. Target Detection and Tracking Combining Four Frame Differential and Optical Flow Method [J]. Optoelectronic Engineering, 2018, 45(8):35-42

[6] Meng Haolei, Liu Zhicheng, Wu Zhongli, et al. An improved motion vehicle detection method based on fusion of inter frame difference and background difference [J]. Logistics Technology, 2018, 37(10):82-89134

[7] Yin Hongjuan, Luan Shuai. Analysis and Verification of Three Frame Differential Motion Object Detection Algorithm [J]. Computer and Digital Engineering, 2017(1):69-71, 87

[8] Shen Yu, Wang Xinxin. Video motion object detection method based on background subtraction and inter frame difference method [J]. Automation and Instrumentation, 2017(4):122-124

[9] Wang Ning, Zhou Ming, Du Qinglei, et al. A Fast Infrared Image Segmentation Algorithm Based on Otsu Criterion [J]. Journal of Air Force Early Warning Academy,

2019, 33(2):88-92

[10] Ding Dongyan, Tu Hongqing. Laser image contour detection using maximum inter class variance method [J]. Laser Journal, 2019(10):95-98

[11] Ma Yufei. Research on Image Edge Detection Algorithm Based on Gradient Operator [D]. Xi'an: Xi'an University of Electronic Science and Technology, 2012

Analysis of Causes and Coping Strategies for Academic Burnout Among Nursing College Students

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Abstract: As an important part of the future medical system, the degree of academic burnout of nursing college students will directly affect their future career development and service quality. the study of academic burnout of nursing college students has important practical significance and long-term value. This article analyzes the influencing factors of academic burnout and proposes coping strategies at the four levels of individual, school, family and society to help nursing college students better cope with academic pressure and challenges, improve learning effects and mental health, and cultivate high-quality nursing talents for the country and society.

Keywords: Nursing College Students, Academic Burnout, Cause Analysis, Coping Strategies

1. RESEARCH SIGNIFICANCE

With the continuous development of China's social economy and the aging of the population, the status of nursing in the medical system has gradually improved, and the demand for nursing talents has also increased. Nursing is a highly specialized and practical discipline that requires students to have extremely high professional knowledge and skills. At the same time, nursing students also need to face future career competition and employment pressure, which further aggravates their academic burden and psychological pressure, and academic burnout occurs. This phenomenon manifests itself in lack of interest in learning, decreased motivation, low mood, etc., which seriously affects students' academic performance and mental health.

At present, social competition is fierce, and the education system is also constantly reforming. These factors have a profound impact on the psychology and behavior of nursing college students. On the one hand, social competition prompts students to study harder to improve their competitiveness; on the other hand, the reform of the education system may also bring some uncertainty and pressure, further aggravating students' academic burnout. By studying the phenomenon of academic burnout of nursing college students and its influencing factors, we can deeply understand the students' learning status and psychological needs, so as to improve teaching methods and means in a targeted manner and improve teaching quality and effect. Proposing effective solutions will help promote the all-round development of students, improve their comprehensive quality and competitiveness, and provide a strong talent guarantee for the development of medical and health care.

2. ANALYSIS OF THE CAUSES OF ACADEMIC BURNOUT

Through questionnaire surveys and in-depth interviews, it was found that academic burnout of nursing college students is a complex phenomenon. the influencing factors involve many aspects, both internal and external, including students themselves, schools, students' families and social factors.

2.1 Student factors

Heavy academic workload and high learning pressure. Nursing students face heavy course loads and clinical practice requirements. College students need to complete a large amount of homework, clinical practice, exams, and papers. Continuous pressure can cause students to lose interest in learning and feel

burnout.

Lack of interest and addiction to games. Students lack interest in the nursing profession, have no goals, and lack motivation. Excessive use of the Internet, social media, online games and other virtual entertainment activities distracts students from their studies and accelerates the degree of academic burnout.

Lack of effective learning methods and strategies. Some students may not have a reasonable time management plan, which leads to delayed learning progress, and lack of effective learning methods, which leads to low learning efficiency, disordered learning, and academic burnout.

2.2 School factors

The curriculum is not reasonable. the difficulty of some courses does not match the progress. the course content is too difficult or too easy, and the learning progress is too fast or too slow, which will make students feel frustrated or bored and produce burnout. Some course content is repeated in different courses, wasting students' time and increasing the learning burden. Some course content has a low correlation with students' interests, personal experiences and career goals, making it difficult to stimulate learning motivation.

Teachers' inappropriate teaching methods. the course content is too boring, the teaching methods are monotonous, and there is a lack of interaction and participation, which can easily make students feel bored. Teachers ignore individual differences among students and do not develop differentiated teaching strategies based on the learning styles and abilities of different students. Lack of feedback and evaluation means that students cannot understand their learning outcomes in a timely manner and lack the motivation and direction to improve. the disconnection between theory and practice can lead to a decline in students' interest in learning and burnout.

The learning atmosphere is not strong. There is a lack of positive academic atmosphere and strict study style on campus, and there is a lack of academic communication and cooperation among students. the school overemphasizes grades and competition, and ignores the all-round development and mental health of students. the campus discipline is loose, and students are prone to indulge in bad habits,

which will have a negative impact on students.

2.3 Family factors

Parents' excessive expectations and pressure transmission. Many families have extremely high expectations for their children, hoping that they can achieve excellent academic results. However, when these expectations exceed the children's actual abilities, they will bring tremendous psychological pressure to the children, causing them to feel anxious, depressed, and even aversion to learning. Parents' own pressure and concerns about their children's future will also be unconsciously passed on to their children, making them feel that they must bear the burden of the family. This kind of pressure, which accumulates over a long period of time, can easily lead to academic burnout.

Lack of support and encouragement in family relationships. Tension and disharmony among family members will cause emotional distress to children and prevent them from focusing on their studies. Children need support and encouragement from their families during their studies. If the family lacks such an atmosphere, children are likely to feel isolated and helpless when they encounter difficulties in their studies. They are prone to negative emotions such as aversion to learning and avoidance, and feel burnout.

Inappropriate family education methods. Some parents over-intervene in their children's learning, not only taking care of their children's learning tasks, but also strictly controlling their learning methods and habits. This kind of education method will weaken children's autonomy and independence, and make them lose interest and motivation in learning. Parents ignore the differences between children and adopt a one-size-fits-all education method, which will make children feel uncomfortable and frustrated, and produce academic burnout.

Family financial difficulties. Family financial difficulties may prevent children from getting enough resources and support in their studies, such as extracurricular tutoring, learning materials, etc. This will affect children's learning enthusiasm and self-confidence to a certain extent, and further aggravate academic burnout.

2.4 Social factors

Employment prospects and competitive

pressure. With the continuous expansion of colleges and universities, the number of nursing graduates has increased year by year, but the number of jobs in the job market has not increased at the same time, resulting in greater employment pressure for nursing students. Many employers not only value academic qualifications when recruiting, but also pay more attention to the practical experience and comprehensive ability of applicants. This means that nursing students not only have to complete their studies while in school, but also have to work hard to find internship opportunities and accumulate practical experience, which increases their psychological pressure.

Society has cognitive biases against the nursing profession. Some traditional concepts believe that nursing work is a low-level, low-skilled service job. This cognitive bias and discrimination may cause nursing students to have an inferiority complex, reduce their sense of identity and belonging to the profession, and thus affect their learning enthusiasm and motivation. If nurses have a low social status and poor treatment, nursing students may feel worried and confused about their future employment prospects, thus losing their enthusiasm for learning.

3. COPING STRATEGIES FOR ACADEMIC BURNOUT

To address the problem of academic burnout among nursing college students, we should consider the causes at all levels and angles and develop a comprehensive and effective strategy.

3.1 Student-level countermeasures

First, we need to enhance the self-awareness and self-regulation of nursing college students. Guide students to conduct self-assessment, understand their interests, strengths and weaknesses, and develop a study plan that suits them. Set clear learning goals, break down big goals into small goals, and reward yourself when you complete them to enhance your learning motivation. Teach students how to find information and solve problems independently, cultivate their independent learning ability, and reduce the fatigue of external dependence. Teach students to learn time management and stress regulation skills, such as relieving stress in learning through

meditation, exercise, etc. Encourage students to participate in practical activities, volunteer services and research projects related to the nursing profession to enhance their understanding and interest in the profession.

3.2 Countermeasures at the school level

Schools should adjust the course structure according to industry needs and student feedback to ensure that the course content is both in line with professional standards and close to practical applications. Training teachers can adopt a variety of teaching methods, such as case teaching, group discussion, simulation training, etc., to improve the interactivity and fun of the classroom. Schools should strengthen the construction of academic atmosphere and style of study, organize academic lectures, seminars and other activities, create a strong academic atmosphere, and stimulate students' interest in learning and thirst for knowledge. Establish a strict attendance and examination system, maintain a good style of study, and prevent students from becoming burnout due to laziness. Schools should set up psychological counseling centers to provide students with professional psychological counseling services to help nursing college students solve psychological problems. Carry out more mental health education activities, such as lectures on themes such as stress management and emotional regulation, to improve students' psychological quality.

3.3 Countermeasures at the Family Level

Parents should strengthen communication with their children, understand their ideas and needs, and jointly develop reasonable learning plans and goals. They should pay more attention to their children's learning and living conditions, give them enough support and encouragement, and help them develop a positive learning attitude. They should create a harmonious and stable family atmosphere, create a good learning environment for their children, and reduce external interference and negative influences.

3.4. Social measures

The government should use media publicity and policy guidance to improve the public's awareness and recognition of the nursing profession and eliminate prejudice and discrimination. It should commend outstanding nursing talents, set an example for

the industry, and encourage more students to join the nursing profession. It is necessary to strengthen cooperation with employers such as medical institutions and nursing homes, provide more internship and employment opportunities for students, help them understand the current status and future development trends of the industry, enhance students' sense of professional identity and belonging, and reduce academic burnout.

In summary, the countermeasures for academic burnout of nursing college students need to take comprehensive measures to deal with it. By enhancing students' self-cognition and adjustment ability, improving learning motivation and interest, optimizing the school teaching environment, and strengthening family support and social recognition, students' academic burnout can be effectively alleviated and their all-round development can be promoted.

REFERENCES

[1] Zhang Xin, Gao Yuanyuan. (2019). Study on academic burnout of medical students and its influencing factors [J]. Health Vocational Education (8), 126-128.

[2] Yang Yueqiao, Le Hong. (2020) the impact of anxiety and depression on learning burnout among medical college students in Hubei Province [J]. Occupation and Health, 36(19):2698-2701.

[3] Wei Huanhuan, Liu Huan, Shi Min, Li Yuanzhen, Tao Xiubin. (2020). Study on the current status and influencing factors of learning burnout among undergraduate nursing students [J]. Journal of Changzhi Medical College. 34(06):418-422.

[4] Zhang Jiping, Liu Qianying. (2023). Academic burnout of college students in the new era: connotation positioning, problem attribution and solution [J]. Higher Science Education (1):26-33.

Application Study of Art Healing in The Mental Health Education of Higher Vocational College Students

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Abstract: This paper aims to explore the application effect of art healing in the mental health education of higher vocational college students, and analyze its specific role in improving students' mental health level, enhancing self-cognition and improving emotional regulation. Through theoretical combing and empirical analysis, combined with various art forms such as music, painting and dance, the feasibility and implementation strategies of art healing in mental health education in higher vocational colleges are discussed. the results show that art healing provides an innovative path for the mental health education of higher vocational college students and helps to promote the comprehensive development of students.

Key words: Art healing; Higher vocational college students; Mental health education

1. FOREWORD

In the rapidly changing modern society, higher vocational college students, as an important part of higher education, are facing multiple pressures such as academic study, employment and interpersonal skills. These pressures often have a negative impact on students' mental health, leading to frequent psychological problems such as anxiety and depression. Traditional mental health education methods, although they can help students cope with psychological challenges to some extent, often focus on the transmission of knowledge and lack deep attention to students' emotions and experiences. Therefore, it is particularly important to explore more comprehensive and effective ways of mental health education.

As a treatment method integrating art, psychology and pedagogy theory and practice, artistic healing provides a new perspective for the mental health education of higher vocational college students with its unique non-verbal communication mode. Through the process of artistic creation, students can express their emotions and explore themselves in a safe and warm environment, so as to realize psychological healing.

2. OVERVIEW OF ART HEALING

Artistic healing refers to a non-traditional method that helps individuals to engage in emotional expression, self-exploration, and psychotherapy through the process of artistic creation and appreciation. It integrates the theory and practice of art, psychology and pedagogy, through painting, dance, sculpture, handwork and other forms of music, guide individuals to communicate and express in a safe and warm environment. Artistic healing emphasizes the individual's subjective experience and emotional release, and promotes the psychological balance and growth of individuals through the process of artistic creation.

3. CURRENT SITUATION OF MENTAL HEALTH OF HIGHER VOCATIONAL COLLEGE STUDENTS

As a special group of higher education, higher vocational college students have their own unique psychological characteristics. On the one hand, they are more curious and innovative and curious about new things; on the other hand, they are more concerned about job prospects, application of skills, and practical experience, which can lead to anxiety, self-doubt and even burnout.

Although traditional mental health education methods, such as classroom teaching and psychological counseling, can help students cope with psychological challenges to some extent, they are often difficult to meet the diverse needs of students. Therefore, it is of

great significance to explore more comprehensive and effective ways of mental health education to promote the mental health of higher vocational college students.

4. APPLICATION OF ART HEALING IN THE MENTAL HEALTH EDUCATION OF HIGHER VOCATIONAL COLLEGE STUDENTS

4.1 Theoretical basis

the application of art healing in the mental health education of higher vocational college students is mainly based on the following theoretical basis:

4.1.1 Expressed art therapy theory: This theory holds that the process of artistic creation can promote individuals' emotional expression and self-cognition, and convey their inner feelings and needs through non-verbal ways.

4.1.2 Humanitarian psychology: it emphasizes the self-realization and potential play of individuals, and believes that individuals have the ability of self-healing, and can stimulate the internal potential of individuals through artistic creation.

4.1.3 Emotion regulation theory: It is believed that artistic healing helps individuals to regulate emotions, release negative emotions through artistic creation, and enhance positive emotional experience.

4.2 Practical application

In the mental health education of higher vocational college students, art healing can be applied in various forms, including the following aspects:

4.2.1 Painting healing

Painting therapy is the most common form of art healing. Through painting creation, students can intuitively express their inner world and release their inner depression and conflict. Teachers can design a series of painting activities, such as self-portrait, emotional color expression, mandura painting, etc., to guide students to explore themselves and regulate their emotions through painting. In the process of painting, students can freely express their feelings and ideas, reduce the psychological burden, and enhance their self-cognition.

4.2.2 Music healing

Music has a unique role of emotion regulation effects. By listening, playing or creating music, students can relax and relieve anxiety. Teachers can organize music relaxation training, improvisation and other activities, so that students can experience peace and pleasure in the music. At the same time, teachers can also design personalized music therapy programs according to students' different needs and characteristics, such as using specific music repertoire for emotional regulation or relaxation training.

4.2.3 Dance healing

Dance therapy is a systemic form of exercise that stimulates the energy and vitality of the body through the movement and rhythm of the dance. In the mental health education of higher vocational college students, dance therapy can be applied in the form of dance courses or workshops. Teachers can design a series of dance movements and rhythm combinations to guide students to release pressure and enhance their confidence in dancing. At the same time, teachers can also combine the theme and content of the dance, guide students to express emotion and self-exploration, and promote the improvement of mental health level.

4.2.4 Comprehensive art healing

In addition to a single painting, music or dance therapy, a variety of art forms can also be comprehensively applied to form a comprehensive art therapy. Through integrated art therapy, students can express their emotions and needs more comprehensively, and enhance their self-cognition and emotion regulation abilities. Teachers can design personalized comprehensive art treatment programs according to the different characteristics and needs of students, and organically combine painting, music, dance and other forms, so as to achieve the best effect of psychological healing.

4.3 Implementation strategy

In order to ensure the effective implementation of art healing in the mental health education of higher vocational college students, the following strategies can be adopted:

4.3.1 Curriculum integration

Art healing is integrated into the mental health education courses, and the mental health education content mainly based on artistic creation is designed. Teachers can design a

series of artistic creation activities, such as painting creation, music performance, dance performance, etc., so that students can gain psychological growth and improvement in the process of participating in the activities.

4.3.2 Group tutoring

Art healing group counseling activities are carried out to help students enhance their sense of belonging and social support in teamwork. Teachers can organize different forms of group tutoring activities, such as painting workshops, music salons, dance group training, etc., so that students can enhance friendship and trust, enhance team cohesion and cooperation ability in the process of joint creation and performance.

4.3.3 Individual consultation

One-to-one art therapy counseling service is provided for students with serious mental health problems. Teachers can make personalized consultation programs according to their specific conditions and needs, and help students to express their emotions and self-exploration through painting, music or dance, so as to relieve psychological pressure and distress.

5. EMPIRICAL STUDY

In order to verify the effect of art healing in the mental health education of higher vocational college students, this paper conducts an empirical study. Questionnaire survey, interview and observation were used to evaluate the vocational college students involved in art healing activities.

5.1 Study design

5.1.1 Study subjects

A number of mental health education students from a higher vocational college was selected as a total of 100 students. 50 boys and 50 girls; age range between 18-22.

5.1.2 Research tools

The Symptom Self-assessment Scale (SCL-90) and the Overall Well-being Scale (GWB) were used as assessment tools. Among them, the Symptoms Self-assessment Scale (SCL-90) is used to assess students' mental health, including anxiety, depression, hostility, terror and other dimensions; the Overall Happiness Scale (GWB) is used to assess the overall happiness level of students.

5.1.3 Research process

The study subjects were randomly divided into 50 participants in the experimental and control group. the experimental group participated in 8 weeks of art healing activities, including painting creation, music performance and dance performance; the control group did not participate in any art healing activities. Both groups were evaluated on the Symptoms Self-Assessment Scale (SCL-90) and the Overall Happiness Scale (GWB) before and after the activity.

5.2 Study results

5.2.1 Improvement of the mental health status

After participating in the art healing activities, the scores of all dimensions of the Symptoms Self-rating Scale (SCL-90) decreased, especially in the scores of negative emotions such as anxiety and depression ($p < 0.05$). This shows that art healing activities effectively relieve students' psychological stress and negative emotions.

5.2.2 Increasing overall happiness

After participating in the experimental group, the score of the Overall Happiness Scale (GWB) increased significantly ($p < 0.05$). This indicates that artistic healing activities enhance students' experience of happiness and satisfaction with life.

5.2.3 Enhanced self-awareness

Through interviews and observations, it was found that the students in the experimental group showed stronger self-cognition ability and emotional expression ability after participating in the art healing activities. They can have a clearer understanding of their inner needs and emotional states, and learn to express their feelings and thoughts in non-verbal ways.

6. DISCUSSION AND ANALYSIS

6.1 The positive impact of artistic healing on the mental health of higher vocational college students

The results of this study show that art healing has a significant positive impact on the mental health of vocational college students. Through the process of artistic creation and appreciation, students can release the inner depression and conflict, and enhance their self-cognition and emotional regulation ability. At the same time, artistic healing can also improve students' happiness experience and

satisfaction with life, and promote their all-round development.

6.2 differences in healing effects of different art forms

This study also found that there were some differences in the healing effects of different art forms. Painting therapy has unique advantages in emotional expression and self-cognition; music therapy has remarkable results in emotional regulation and relaxation training, and dance therapy can enhance students' physical vitality and self-confidence. Therefore, appropriate art forms should be selected according to the specific needs and characteristics of students.

6.3 The promotion value of art healing in the mental health education in higher vocational colleges

As an innovative method of mental health education, art therapy has extensive promotion value. It is not only applicable to higher vocational college students, but also can be extended to other age groups and fields of students. At the same time, the implementation process of artistic healing is simple, low cost, the effect is remarkable, with high practicability and feasibility. Therefore, colleges and universities should actively promote and apply art healing methods to provide more comprehensive support and guarantee for students' mental health.

7. CONCLUSION AND OUTLOOK

7.1 Study conclusions

This study discusses the application effect of art healing in the mental health education of higher vocational college students by combining theoretical analysis and empirical research. the results show that artistic healing can significantly improve students' mental health, enhance self-cognitive ability and happiness experience. the healing effects of different art forms vary somewhat but all show positive psychological intervention. Therefore, art healing has a wide application prospect and promotion value in the mental health education of higher vocational college students.

7.2 Research outlook

Future studies can further explore the specific role mechanism and optimization strategies of art healing in the mental health education of higher vocational college students. At the same time, comprehensive intervention research can be combined with other psychological intervention methods such as cognitive behavioral therapy and mindfulness therapy to explore a more comprehensive and effective mental health education model. In addition, with the continuous progress and development of technology, the application of virtual reality (VR), augmented reality (AR) and other new technologies can also be explored in art therapy to improve the intervention effect and user experience.

REFERENCE

[1] Fang silin. (2024). the application study of "artistic healing" in the mental health education of college students. Journal of Jiamusi Vocational College, 30(3), 82-85.

[2] Chen Jiajie, Wang Zhuokai, Meng Shuo. (2022). Expression art therapy is used for mental health education. Beijing Education (moral education), (1), 85-88.

[3] Fan Xiaoyuan. (2021). Exploration on the application path of developmental art therapy in mental health education in art universities. Popular Literature and Art, (19), 198-201.

[4] Xu Zengliu. (2022). Research on the application of art healing in colleges and universities. Work Brief of Student Engineering Department of Party Committee of China Academy of Art, (9), 64-67.

Characteristics of Digital RMB

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Abstract: Digital RMB is a digital form of legal tender issued by the People's Bank of China. the issuance of digital RMB will have a profound impact on various fields such as China's economy, finance, technology, and society. Its main characteristics are evident.
Keywords: digital RMB, Legal Tender, Substitutability, Controllable Anonymity

1. INTRODUCTION

As the global digital economy flourishes, central banks around the world are exploring the possibilities of legal digital currencies. Digital currencies not only represent an innovation in traditional currency forms but also signify the future direction of financial technology. As the world's second-largest economy, China's exploration in the field of digital currency is particularly noteworthy. the People's Bank of China (PBOC) began researching legal digital currency in 2014 and launched the pilot of the digital RMB (e-CNY) in 2020, with the following main characteristics.

2. LEGAL TENDER

The legal tender status of digital RMB means that as the national currency, it is backed by state credit and enjoys the same legal standing as traditional paper money and coins. Specifically, the legal tender status of digital RMB is reflected in the following aspects:

2.1 National Credit Endorsement: Digital RMB is issued by the People's Bank of China, representing the state credit. This means it possesses the same credibility and security as traditional RMB.

2.2 Legal Currency Status: According to relevant laws and regulations, digital RMB holds the same legal status as paper money and coins in China. It can be used in all scenarios where legal tender is accepted, and no entity or individual can refuse to accept it.

2.3 Mandatory Circulation: Digital RMB is mandatorily circulated within China. All establishments and businesses that accept RMB cash must also accept digital RMB payments.

2.4 Currency Substitutability: Digital RMB is designed to replace M0 (cash in circulation), primarily for daily retail payment scenarios, meeting the public's demand for cash.

2.5 Legal Protection: the Chinese government and the People's Bank of China have enacted relevant laws and regulations to ensure a solid legal foundation for issuing, using, and managing digital RMB. These laws and regulations provide strong guarantees for the circulation and usage of digital RMB.

3. SUBSTITUTABILITY

The substitutability of digital RMB primarily lies in its role as a substitute for cash in circulation (M0). Specifically, this substitutability includes several aspects:

3.1 Replacing Paper Money and Coins: Digital RMB aims to replace physical forms of paper money and coins, becoming a new form of cash. Users can use digital RMB for daily consumption and transactions without carrying traditional paper money and coins.

3.2 Payment Convenience: Digital RMB allows payments through mobile devices (such as smartphones), offering a more convenient payment method compared to paper money and coins. Whether for online or offline payments, digital RMB can be used through methods like QR code scanning, and near-field communication (NFC), simplifying the payment process [1].

3.3 Reducing Cash Management Costs: Using digital RMB can reduce costs associated with printing, transporting, storing, and managing paper money and coins. For banks and other financial institutions, digital RMB can significantly lower operational expenses related to cash management.

3.4 Improving Payment Efficiency: the use of digital RMB can significantly enhance payment efficiency, especially in small-value and high-frequency transactions. Digital RMB offers faster payment speeds and shorter

settlement times than paper money and coins, contributing to overall efficiency in the payment system [2]··

3.5 Promoting Cashless Society Development: the promotion of digital RMB helps drive the development of a cashless society, reducing reliance on physical cash and promoting a more modern and efficient payment environment.

3.6 Financial Inclusion: Digital RMB can reach areas and populations with limited banking services, providing convenient payment methods and promoting financial inclusion. More people can access modern financial services through digital RMB, enhancing financial inclusiveness [3]··

The substitutability of digital RMB not only provides more efficient payment methods at the technical level but also promotes the widespread availability of financial services and shifts in payment habits at the societal level

4. CONTROLLABLE ANONYMITY

The controllable anonymity of digital RMB refers to the ability to protect user privacy while ensuring that the central bank can track and monitor fund flows when necessary, to prevent and combat financial crimes. This characteristic aims to balance privacy protection with regulatory requirements, including the following aspects:

4.1 Privacy Protection: Digital RMB provides a level of anonymity similar to cash for small-value transactions in daily use, allowing users to make payments to some extent anonymously, protecting personal privacy. Transaction information of users is not fully disclosed in routine use and is only subject to review by regulatory authorities under specific circumstances.

4.2 Control: the digital RMB system is designed with multi-layered privacy protection mechanisms to ensure that the central bank can access crucial transaction information when necessary. This mechanism allows regulatory authorities to track suspicious transactions legally and when necessary, preventing money laundering, terrorist financing, and other financial crimes. Through technological means and regulatory measures, the central bank can monitor and analyze large and suspicious transactions to

ensure the security and stability of the financial system [4]··

4.3 Transaction Records: Every transaction of digital RMB is recorded in a traceable ledger maintained by the central bank or authorized institutions. While transaction records can be traced, ordinary users and businesses can rest assured that their transaction records will not be accessed arbitrarily in the absence of illegal activities, ensuring the privacy of legitimate transactions.

4.4 Legal and Policy Safeguards: the Chinese government and the People's Bank of China have established relevant laws and regulations that clarify the principles and operational details of privacy protection and regulation regarding digital RMB. These laws ensure the protection of user privacy while empowering regulatory authorities to conduct necessary monitoring and tracking within legal boundaries.

Through the design of controllable anonymity, digital RMB meets the public's demand for payment privacy while ensuring effective regulation of fund flows when necessary to prevent financial crimes, achieving a balance between privacy protection and financial security.

5. DUAL-LAYER OPERATIONAL SYSTEM

The dual-layer operational system of digital RMB refers to a two-tiered structure implemented in the issuance and circulation of digital RMB, ensuring effective currency management and extensive market coverage. Specifically, this dual-layer operational system consists of the following two levels:

5.1 First Tier: Central Bank (People's Bank of China):Issuance and Management: the People's Bank of China, as the central bank, is responsible for issuing, withdrawing, and controlling the total supply of digital RMB. Through this tier, the central bank ensures the monetary policy functions and financial stability of digital RMB.

Technical Standards and Regulation: the central bank establishes technical standards, operational norms, and regulatory frameworks for digital RMB to ensure the security, stability, and uniformity of the entire system.

Security Assurance: the central bank in the first-tier system undertakes core security

responsibilities for digital RMB, ensuring the reliability and anti-counterfeiting capabilities of the currency.

5.2 Distribution and Services: Commercial banks (such as Industrial and Commercial Bank of China, China Construction Bank, etc.) and other qualified financial institutions are responsible for distributing and daily operations of digital RMB. They provide digital RMB to a wide range of users, including individual consumers and businesses, through their networks and service channels.

Customer Management and Services: Commercial banks and operating institutions handle the opening of digital RMB wallets, customer services, and technical support. They leverage existing banking systems and customer bases to promote widespread adoption of digital RMB.

Market Promotion and Applications: These institutions, in the second-tier operational system, promote the use of digital RMB in various payment scenarios such as retail payments, public service payments, etc., through market promotion and innovative applications.

This dual-layer operational system not only effectively utilizes the advantages of central banks and commercial banks but also ensures the security, reliability, and extensive application of digital RMB, providing strong support for the development of China's digital economy and financial system.

The introduction of digital RMB has profound implications for monetary policy and financial stability. Its transparency and traceability enhance the central bank's monitoring capabilities over fund flows, aiding in preventing financial risks. Additionally, digital RMB has brought changes to the payment market and the operating models of commercial banks, fostering competition and innovation in the payment market.

REFERENCES
[1] Mu, J. (2020). Opportunities, Challenges, and Prospects for the Central Bank to Promote the Legal Digital Currency (DCEP). Economist, 95-105.

[2] Chabbi, S., Boudour, R., Semchedine, F., & Chefrour, D. (2020). Dynamic array PIN: A novel approach to secure NFC electronic payment between ATM and smartphone. Information Security Journal: A Global Perspective, 29(6), 327-340.

[3] Loh, X. -M., Lee, V. -H., Tan, G. W. -H., Hew, J. -J., & Ooi, K. -B. (2022). Towards a cashless society: the imminent role of wearable technology. Journal of Computer Information Systems, 62(1), 39-49.

[4] Yang, S., & Yi, Y. (2021). Effect of technological innovation inputs on global value chains status. Journal of Global Information Management, 29(5), 37-54.

Research on The Application of Situational Teaching Method in Middle School Physical Education

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Abstract: At present, insufficient physical activity of middle school students in our country, can't reach the requirement of promoting physical health, the enthusiasm of physical education class is not high, extracurricular physical activity escapes, the reason for causing this situation, the teaching method of physical education teacher should have its main reasons. This thesis mainly studies the application of situational teaching method in middle school physical education teaching. In order to stimulate the motivation of middle school students and improve their physical education initiative, the ideal fitness effect has been obtained, and some useful teaching reference has been given to middle school physical education teachers.

Key words: Middle School; Situational Teaching Method; Applied Research

1. INTRODUCTION

High school is an important stage of development, the life is the key to the values, world outlook, the outlook on life, forming period; At the same time, it is also the key period for the formation of sports technology and sports consciousness. the cultivation of physical education consciousness needs regular practice and study. In physical education teaching, the teacher's teaching method has a direct influence on the teaching effect. At the same time, it also has a great impact on the initiative and enthusiasm of middle school students' sports learning. Compared with traditional teaching methods, situational teaching method takes all aspects of students' development into account when creating problem scenarios, and emphasizes students' personal development as the center, so that middle school students can better integrate into physical education teaching.

2. RESEARCH OBJECT AND METHOD

2.1 Research object

Part based on Tai'an City tai shan district middle school as the research object, randomly selected from 6 middle schools, the junior middle school three (taishan college, taian no. 6 middle school, dongyue middle school) of the affiliated high school, high school three (tai shan middle school, taian, the Great Wall the second middle school high school), at the same time, every school to select 60 students, four teachers as the investigation object.

2.2 Research Methods

2.2.1 Literature method

In the China National Knowledge Network, the relevant situation teaching method was collected in the libraries of colleges and universities in Tai 'an City, and the collected materials were carefully sorted out in the later stage, which laid a solid theoretical foundation for this research.

2.2.2 Interview method

Interviews were conducted with PE teachers, students and school leaders selected from each middle school to understand the reality of PE teaching in middle schools, and on-site observation of PE classroom teaching in each middle school. the above interviews provided basic ideas and methods for the writing of the paper.

2.2.3 questionnaire investigation

A total of 360 questionnaires were sent out and 326 were recovered, with a recovery rate of 90.6%, and 315 effective questionnaires with an effective rate of 87.4%.

2.2.4 Statistical method

The effective questionnaires collected were sorted out and analyzed by using relevant software.

3. RESULTS AND ANALYSIS

3.1 Investigation And Analysis Of Students' Participation In Physical Education

Through the analysis of the valid questionnaires collected, it can be seen that the participation level of students in physical education is different in different middle schools. Some schools have a good participation level, such as 89% in the affiliated Middle School of Taishan University, but some schools have a low participation level. Participation in general, junior high school is significantly higher than that of high school, because high school learning pressure big, facing the university entrance exam. Physical education teachers should improve the enthusiasm and initiative of students through various effective methods, and give full play to the main role of students.

3.2 Analysis of influencing factors of student participation

Through interviews, learn about the students participate in sports are many influence factors of classroom teaching, students' personal factors, their goals are not clear, weak willpower, etc.; There are also family factors, such as left-behind children, lack of family companionship; There are also the factors of educational methods, teachers are the leading teaching, which inevitably leads to the loss of students' learning enthusiasm.

3.3 Analysis of teaching methods

Through questionnaires and interviews, it can be seen that the six middle schools surveyed all adopt the traditional teaching method of explanation and demonstration, which mainly means that PE teachers teach and students practice by themselves. PE teachers are the leaders of the class, and students are passive recipients, so students lose their enthusiasm and initiative in learning and have no interest in participating in sports activities.

3.4 Application of situational teaching method

3.4.1 Theoretical basis of situational teaching method

The theoretical foundation of the situational teaching method is the psychological theory of cognitive and affective interaction. the basic framework is that according to the teacher's application situation, the teacher creates the theme picture in the teaching equipment, and matches the text and music to reproduce the knowledge content of the textbook, so that students can feel as if they are in the knowledge they have learned and have a feeling of being there. Therefore, in the middle school physical education classroom teaching, physical education teachers can fully use situational teaching method to let middle school students into the physical education classroom, improve the enthusiasm and initiative of students to participate in sports, conducive to the cultivation of interest in sports.

3.4.2 Application cases of situational teaching method in PE teaching

Middle school sports teaching, scene teaching method with case is more, introduced in volleyball teaching, for example, first of all, according to the practical teaching, and import the volleyball course teaching in volleyball culture, especially the accomplishments of our national women's volleyball team talk, best cooperate video interpretation, it can fully arouse the enthusiasm of students learning volleyball, and it also illustrates the feeling; Secondly, demonstration and explanation, group practice, in the process of practice, according to the difficulty of volleyball action, reasonable decomposition of action, reasonable group, until students fully grasp the movement; Thirdly, we must pay attention to the individual differences of students, teaching according to their aptitude, can not be the same; Finally, the class summary, the volleyball movement of the study is evaluated, teachers and students evaluate together, find out the good place, correct the wrong place.

3.4.3 Analysis of application effect of situational teaching method

Through the effective questionnaires and interviews collected and the application of situational teaching method, the surveyed students have greatly improved their interest in sports learning. They like physical education and are willing to participate in extracurricular sports activities, and their attitude towards sports has undergone positive changes. It shows that the traditional physical education teaching method does not pay attention to the needs of individual students, cramming teaching, ignoring the subjectivity of students, but the situational teaching method can better meet the needs of middle school students for physical education, can fully mobilize the enthusiasm and interest of

learning, and promote the positive change of physical education attitude.

In terms of the comparison of performance, through the changes of performance before and after the application of the test, it is found that the sports performance has also been greatly improved, which mainly tests the 50 meters, 1000 meters, pull-ups and standing long jump of boys, and 50 meters, 800 meters, sit-ups and standing long jump of girls. the application of situational teaching method has improved the enthusiasm and initiative, and improved the classroom efficiency. Students' physical fitness has improved, and so has their athletic performance.

4. CONCLUSIONS AND SUGGESTIONS

4.1 Conclusion

The traditional physical education teaching method is teacher-led and students passively accept knowledge and technology, which seriously hinders the enthusiasm and creativity of physical education learning and is not conducive to the formation and development of lifelong physical education consciousness. In the investigation of 6 middle school, the traditional sports teaching method is a main position, so that led to the students' physical education learning enthusiasm is not high, physical education learning interest is not high. There are many factors that affect the interest of sports learning, including students' personal factors, family factors, and teaching methods.

After the implementation of situational teaching method, students' interest in physical education learning improved, their enthusiasm and initiative, the physical quality has also improved, compared the performance of the traditional sports teaching method has greatly improved.

The implementation of the situational teaching method, fully embodies the students' main body status, to students' development as the center, to create suitable for students' actual level, exploring in the problem, physical education learning interest in nature is improved.

4.2 Suggestions

Sports teaching is different from other subjects, it needs a lot of sports venues and facilities, the lack of venues and facilities causes the difficulty of teaching. In several middle schools investigated, sports facilities can not meet the normal needs of sports teaching to varying degrees. Therefore, the construction of sports facilities should be increased through various ways, so as to ensure that students have the opportunity to exercise.

Physical education teacher is the main body of physical education teaching activities, physical education teaching activities are different from the general subject teaching, complex facilities, many students, easy to happen accidents, which requires physical education teachers to have flexible adaptability. To acquire the ability to adapt to changes, PE teachers must have a solid basic knowledge, but also have flexible ability to deal with.

In the survey and interview, it has been found that the application of situational teaching method has greatly improved the enthusiasm and initiative of middle school students in physical education learning, and their interest in participating in extracurricular sports activities has also been significantly improved, which not only improves the learning efficiency of students, but also exercises their bodies. Therefore, the application of situational teaching method should be encouraged in the group of physical education teachers.

In the process of sports teaching, should study the new teaching idea, changing learning concept, from sports teachers' teaching and students' learning of duality, teachers and students into a common learning progress. We should also pay attention to the teaching rules, so that students can understand the knowledge, master the essentials of action, master the key points of action; At the same time, physical education teaching attitude is also an important factor affecting teaching, physical education teachers energetic, glowing, positive and cheerful personality, will enhance students' enthusiasm for learning, thereby improving the efficiency of classroom learning.

REFERENCE

[1] Wang Synth. Research on the application of subjective Teaching Model to physical education Teaching [J]. China External Education: Theory, 2008(10):144, 162.
[2] Liu Qingming, Ma Hui, Li Dongming, et

al. Function establishment of government sports department in management of sports industry [J]. Journal of Shenyang Institute of Physical Education, 2009(5):12-14+18.

[3] Chen Yingchuan, Ji Jianqiu, Wu Ming. Research on the operational basis and Social construction of Mass Sports subject's position [J]. Journal of Tianjin University of Sport, 2005(5):59-62.

[4] yeti, dan-song liu, sealing of the flying tigers, etc. An epidemiological study on physical activity and physical fitness of children and adolescents and their risk of obesity [J]. Journal of wuhan sports college, 2015(1):90-95.

Status Quo of Modern Apprentice System Training Mode in China and the Solution Strategy of Existing Problems

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Abstract: Apprenticeship with Chinese characteristics is an important exploration of China's vocational education reform. This paper summarizes the development course, development dilemma and realization path of modern apprenticeship with Chinese characteristics, and holds that the high-quality development of apprenticeship should be promoted from the aspects of improving social awareness, strengthening the connotation construction of vocational colleges, promoting enterprises to become the main body of implementation, giving full play to government functions, and paying attention to skill demand forecasting.

Keywords: Modern Apprenticeship; Talent Cultivation Mode; Status Quo; Existence Problems Solution Strategy

1. INTRODUCTION

Modern apprenticeship is a new talent cultivation model developed on the basis of traditional apprenticeship under the background of industrialization in the 20th century. It is the product of the organic combination of traditional apprenticeship and modern vocational education, and plays an important role in the current vocational skill training in China. Since the Ministry of Education proposed *Exploring High-level Apprenticeship System with Chinese Characteristics* in 2020, vocational colleges at the central, local and various levels have carried out active exploration, but there are still some problems to be solved in practice.

2. DEFINITION OF MODERN APPRENTICESHIP

The modern apprenticeship system was proposed by the Ministry of Education of the People's Republic of China in 2014. It aims to deepen the integration of production and education, school-enterprise cooperation, further improve the school-enterprise cooperation education mechanism, and innovate the training mode of technical and skilled talents. the purpose is to promote the participation of industries and enterprises in the entire process of vocational education talents training, to achieve the docking of professional settings and industrial needs, the docking of course content and professional standards, the docking of teaching process and production process, the docking of graduation certificate and vocational qualification certificate, and the docking of vocational education and lifelong learning, so as to improve the quality and pertinence of talents training.

Presently, in the field of vocational education research, it is generally believed that modern apprenticeship includes three connotations: first, modern apprenticeship is a learning method of technical practice ability based on stable mentoring relationship; secondly, the modern apprenticeship system is a talent training mode combining the new master-apprentice learning mode with the school vocational education. Thirdly, modern apprenticeship is a kind of technical and skilled talents training system based on modern vocational education.

3. REVIEW OF THE DEVELOPMENT OF MODERN APPRENTICESHIP IN CHINA

3.1 Embryonic Stage

In the 1950s, China started the "work-study" vocational education form, and made a meaningful attempt to "modern

apprenticeship". In 2005, the Ministry of Education approved 107 vocational colleges to pilot work-study program, which has accumulated valuable experience for the subsequent training of modern apprenticeship talents. This "work-study" and "work-study combination" model is a typical concrete approach of transition to modern apprenticeship, a courageous improvement of traditional apprenticeship, a manifestation of apprenticeship in a specific social environment, and can be considered as the "budding" of modern apprenticeship in China. In 2010, the Ministry of Education issued the *National Medium and Long Term Education Reform and Development Plan* (2010-2020), proposing "employment-oriented, implementing work-study combination, school-enterprise cooperation", which is an important document of vocational education reform, and has become the guiding ideology of China's vocational education for a certain period, promoting the reform of vocational education at that time whereby a significant school-enterprise cooperation system has been launched.

3.2 Stage of Putting Forward the Concept of "Modern Apprenticeship"

The history of "apprenticeship" in China can be traced back to the Warring States period. the policy of "Separation of the Four Social Levels" in Qi State recorded in " Guanzi ", an ancient philosopher's ideology, records the embryonic form of apprenticeship in ancient China. the concept of modern apprenticeship was originally derived from Western countries. Western developed countries attach great importance to modern apprenticeship, and have perfect supporting policies and legal systems, forming a more mature training model. Germany 's " dual system, " Australia 's " new apprenticeship " and Britain's " sandwich " are all concrete practices of modern apprenticeship in their own countries. It is an inevitable trend for the development of vocational education to incorporate modern apprenticeship into the modern vocational education system. In 2013, there was a serious problem of " labor shortage " in the southeastern coastal cities of China. Lu Xin, then Vice Minister of Education, held a symposium on vocational education reform and proposed the " modern apprenticeship "

for the first time. He hoped that the government, enterprises and industries could participate in vocational education, cultivate skilled talents in line with the needs of the labor market, and alleviate the shortage of labor in the southeastern coastal cities. With the introduction of modern apprenticeship system, its pilot work has been gradually carried out. Jiangxi Xinyu Vocational Education Park is one of the pilot platforms.

3.3 The Construction Stage of the "Modern Apprenticeship" System

In 2014, the Ministry of Education issued the document of *Opinions on Promoting the Pilot Work of Modern Apprenticeship*", which put forward the overall requirements for promoting "modern apprenticeship" from the aspects of working principles, guiding ideology and operating procedures. This is a guiding document for deepening school-enterprise cooperation, integrating production and education, and innovating education mechanism and training model. In June 2014, the State Council issued the *Decision on Accelerating the Development of Modern Vocational Education*. In August 2015, the Ministry of Human Resources and Social Security and the Ministry of Finance jointly issued the *Notice on the Pilot Work of Developing New Apprenticeship System in Enterprises*; In 2017 and 2018, the Ministry of Education included the development of modern apprenticeships in its annual focal work plan. In March 2018, the General Office of the Ministry of Education issued the *Notice on Doing Well in the Pilot Work of Modern Apprenticeship in 2018*, and the pilot work of modern apprenticeship was further launched. In January 2019, the State Council issued the *National Vocational Education Reform Implementation Plan*, which pointed out the direction for the further development of modern apprenticeship.

3.4 The "Modern Apprenticeship" Pilot Implementation Phase

Since August 2015, all over the country has actively carried out the modern apprenticeship pilot application work, after experts' selection, a total of 165 pilot units and industry pilot leading units were selected, involving 17 regions, 8 enterprises, 127 colleges and universities and 13 leading units, China's modern apprenticeship system has entered the

substantive development stage. On this basis, the second and third batches of pilot work were carried out in 2017 and 2018, involving a total of 562 units of local governments, colleges, industries and enterprises. Moreover, in order to ensure the efficiency and quality of the first batch of modern apprenticeship pilots, the Ministry of Education organized experts to review and record the work program of the first batch of pilot units in 2016, which involves the management system, talent training standards, incentive mechanisms, security systems and other aspects. the evaluation, review, summary and reflection of the pilot work is the key link of the in-depth development of modern apprenticeship system in China, which provides guarantee for the sustainable development of modern apprenticeship system.

4. DEVELOPMENT SITUATION OF MODERN APPRENTICESHIP IN CHINA

The apprenticeship system with Chinese characteristics is a model in which enterprises and technical schools, vocational colleges, vocational training institutions, enterprise training centers and other education and training institutions jointly train apprentices through the modes of enterprise-school dual training and alternate training. the apprenticeship system with Chinese characteristics has accumulated certain experience through batch pilots, but some shortcomings were also found.

4.1 Advantages of Modern apprenticeship with Chinese Academic Characteristics

On the basis of inheriting and perfecting the general characteristics of the apprenticeship system, the modern apprenticeship with Chinese characteristics has developed its Chinese characteristics, which together constitutes the connotation of the apprenticeship with Chinese characteristics and gives the unique institutional advantages of the apprenticeship with Chinese characteristics, which are mainly manifested in the following aspects.

4.1.1Flexibility of School-enterprise Cooperation Training

The nationalization of apprenticeship with Chinese characteristics is characterized by the leadership of national authorities, national financial support, and national macro-management. It did not lead to the situation of "management dilemma" and " rigid management". On the contrary, it allows multiple subjects such as local and schools to flexibly choose the core content and measures of modern apprenticeship according to the subjects' specific conditions.

Flexible setting of majors. While the traditional education system usually requires students to choose a specific major or subject direction at the high school level, apprenticeships with Chinese characteristics offer a more flexible learning path. Apprenticeships allow students to choose a profession according to their interests and abilities within a certain range. Apprenticeships combine learning with practice, and students can get access to knowledge and skills in different professional fields in real work, so as to better understand and experience the work content and requirements of different professions, and then make a more informed professional choice. Apprenticeships with Chinese characteristics provide opportunities for career transformation and upgrading for those who are already engaged in a certain profession. the apprenticeship system with Chinese characteristics allows in-service personnel to acquire new professional knowledge and skills through study and practice, so as to achieve career transformation and development in different fields and positions. This provides more options for individuals, enabling them to adapt to changes in socio-economic development and the needs of personal career development. Therefore, by providing flexible learning paths, interdisciplinary training opportunities, practice-oriented career planning, and opportunities for career transformation and upgrading, apprenticeship with Chinese characteristics enables students to choose majors more flexibly, adapt to personal interests, abilities, and development needs, and lay a solid foundation for future career development.

Flexible choice of enterprises. Generally speaking, the enterprises related to apprenticeship with Chinese characteristics are mostly large enterprises, which have a good foundation for cooperation and can provide a lot of job opportunities. the

enterprise has a certain reputation in the region or the industry, and the demand and training of technical skills have a certain demonstration. In the historical period without the support of the state, because of the lack of funds and equipment, colleges and universities are often passive in the selection of cooperative enterprises and cater to the needs of enterprises. the state support for the pilot work of modern apprenticeship can relatively reduce the financial difficulties of colleges and universities, and take the initiative to choose suitable cooperative enterprises.

Flexibility of implementation model. According to the needs of economic and social development, schools and enterprises under the guidance of the state, combined with the employment situation, technical level, industrial characteristics, etc., flexibly adjust the curriculum system and teaching methods to promote regional economic and social development.

4.1.2 Standardization of Personnel Training Process and Quality Standards

Standard and normative ensure that apprenticeship training programs and course content match the vocational needs. Apprentices can obtain high-quality vocational training, improve the competitiveness of employment; Standards and norms ensure that teachers have a certain level of experience and qualifications. they can pass on practical experience to apprentices, and promote the transfer of skills. the standard and standardization enable it to better integrate with the actual industry, provide high-quality vocational education and training, meet the needs of society for talents, and provide more technical and skilled personnel for economic development. In general, the standard and standardization make the apprenticeship system with Chinese characteristics more systematic and orderly, improve the quality of education, protect the rights and interests of apprentices, and promote the sustainable development of economy and society.

4.1.3 Integrate Development and Diversity

The Chinese characterized apprenticeship system emphasizes the complex operation system of diversified cooperation, multi-participation, internal and external integration, division of labor and hierarchical supervision under the macro-management of the government, which guarantees the deep integration of Chinese characteristics apprenticeship education and industry, the coordination of master and apprentice, as well as the democratization and integrated development of the entire Chinese characteristics apprenticeship system, and also gives the Chinese characteristics of apprenticeship system pluralism. the advantages include the pluralism of the implementation subject, the pluralism of the implementation mode and the pluralism of the cooperation mechanism.

The pluralism of the implementation subject means that the Chinese characteristic apprenticeship system emphasizes the participation of multiple subjects. From the formation of management team, the arrangement of teaching process and the implementation of teaching evaluation, all parties are required to actively participate in order to promote the development of apprenticeship system. the diversity of implementation mode means that schools and enterprises should adopt flexible ways to build curriculum systems and teaching forms according to different industry needs, technical levels, industrial characteristics and other factors, such as adopting modular, integrated, segmented and other ways to meet the needs of different industries. In the process of practice, in order to better promote the development of both sides, apprenticeship with Chinese characteristics actively promotes the establishment of effective cooperative relations between vocational colleges, enterprises, industries and governments, so as to better meet the needs of both sides. Therefore, it shows the diversity of cooperation mechanisms.

4.2 Problems in Process of Modern Apprenticeship in China

Compared with developed countries, China's vocational education started late and developed slowly. the modern apprenticeship education mechanism is still in the stage of theoretical research and pilot. Various new problems and new situations are constantly emerging, mainly reflected in the following aspects.

4.2.1 Lack of Macro-level Institutional Guarantee System and Top-level Design

The development of modern apprenticeship is a major reform of national vocational education and a great breakthrough in the talent training mode of vocational colleges. Its implementation requires certain conditions, including external environment such as economy, culture and system, as well as supporting factors such as government funding, policy support and participation of industry and enterprises. In recent years, the Ministry of Education has attached great importance to the pilot work of modern apprenticeship system and achieved certain results. However, from the national macro level, there is still a lack of scientific top-level design. the formulation of modern apprenticeship system is mainly based on the policy documents of work-study combination and school-enterprise cooperation. the relevant supporting laws and regulations are not clear, such as the status of ' students ' in modern apprenticeship system. There are some key problems, lack of specific promotion strategies and solutions, especially the lack of incentive, guarantee and restraint mechanisms for the participation of industry enterprises.

4.2.2"Enthusiastic School and Indifferent Enterprise" School-enterprise cooperation depth is not enough.

Modern apprenticeship is a further extension of school-enterprise cooperation. the depth of school-enterprise cooperation in the implementation of modern apprenticeship depends on the way and foundation of school-enterprise cooperation. On the one hand, due to the influence of teachers' ability, equipment and historical factors, vocational colleges have limited ability to serve enterprises and society. Most of them cannot bring satisfactory cooperation benefits to cooperative enterprises, which greatly affects the quality of school-enterprise cooperation and the enthusiasm of enterprises, and ultimately affects the implementation of modern apprenticeship. On the other hand, the scale and strength of cooperative enterprises also affect the effectiveness of the implementation of modern apprenticeship. the pursuit of profit maximization is the first goal of the enterprise; only in the case of ensuring their own interests, enterprises will consider maximizing their social value. the

implementation of modern apprenticeship is bound to increase the investment of enterprises, resulting in an increase in the operating costs of enterprises, and this part of the cost investment takes a long time to achieve results. the effectiveness of talent training is uncertain for enterprises, such as the rapid loss of trained talents. These two factors together lead to the failure of corporate profits and affect the enthusiasm of enterprises to participate in the training of modern apprenticeship talents.

4.2.3The main bodies of the society is not aware of the modern apprenticeship system.

As an important mode of talent training in vocational education in the future, the state has also issued corresponding policies, but after all, it was put forward rather late, and the popularization and publicity may not be sufficient. As a result, the public, especially the stakeholders, have limited understanding of the modern apprenticeship system, and it is difficult to have full confidence in its talent training program, so they lack the initiative to participate. First of all, the government, as the main body of participation, failed to understand the importance of developing modern apprenticeship from the perspective of vocational education innovation and regional economic development. Second, students and parents believe that the form of part-time work and part-time study is divorced from the essence of education, is a kind of ' sheep ' behavior, it is difficult to accept the training mode of entering the enterprise for apprenticeship learning, and even resist the ' apprenticeship ' class behavior. Thirdly, colleges and universities also lack innovation motivation and sense of responsibility to a certain extent. They believe that modern apprenticeship will bring a lot of trouble and even risks to their work, which also hinders the implementation of modern apprenticeship. Fourth, the enthusiasm of enterprise participation is very limited, and there is a lack of long-term understanding of modern apprenticeship.

4.2.4Lack of Scientific and Reasonable Evaluation Mechanism

Modern apprenticeship is a new form of vocational education in China. It is the deepening of school-enterprise cooperation, the progression of post practice and order

training, and the self-transformation of traditional apprenticeship. the implementation of modern apprenticeship has put forward new requirements for the traditional teaching management system and evaluation mechanism of vocational education. How to calculate the comprehensive credits of student apprentices in enterprise positions, how to formulate learning quality standards, and how to carry out quality assessment; as a guiding identity, there is a lack of a series of necessary management and evaluation systems for college teachers and enterprise masters, such as how to assess, how to identify their performance, how to improve their ability, and how to promote their professional titles. Some units and colleges have issued some assessment methods, but the overall situation is still rough, lack of systematic and scientific, which greatly restricts the development of modern apprenticeship.

5. COUNTERMEASURES AND SUGGESTIONS ON THE IMPLEMENTATION OF MODERN APPRENTICESHIP

Modern apprenticeship has obvious characteristics of "modernity", and the subjects involved include government, colleges, enterprises and students. In order to effectively implement the modern apprenticeship system, it is necessary to find the common interests of all participants in order to ensure its sustainable development.

5.1 The government should improve the system and establish a government-led management mechanism.

Achieving a win-win situation between schools and enterprises is the basic guarantee for the effective operation of modern apprenticeship. China must clearly stipulate the rights and responsibilities of the government, colleges and enterprises and the division of labor and cooperation from the institutional level, policy level and legal level, and accelerate the introduction of a series of policies, laws and regulations that are conducive to the implementation of modern apprenticeship. At the same time, we should protect the interests and rights of cooperative enterprises from the perspectives of financial investment and policy support, and do everything possible to attract enterprises to

participate in the whole process of modern apprenticeship training. For example, financial subsidies and tax relief can be given to cooperative enterprises to make up for the operating costs of enterprises. Provide employment conditions, work injury risks, labor rights and other aspects of protection for student apprentices, improve the professional ability of student apprentices, credit evaluation and assessment system. Establish a management system and operation mechanism that can fully reflect the interests of all participants, refine the operation process, increase publicity, strengthen the leading role of the government, and determine from a macro perspective.

5.2 Enterprises should actively participate in to maximize the value of enterprises.

In the implementation process of modern apprenticeship, there is often a conflict between the profit of enterprises and the goal of talent training in colleges and universities. This requires the joint efforts of both schools and enterprises to find common interests and achieve their respective goals. After careful investigation, it is found that both schools and enterprises also have common goal requirements. In addition to the goal of profit maximization, enterprises still pursue the maximization of enterprise value. the basic connotation of maximizing enterprise value is to realize the sustainable and healthy development of enterprises. In this process, talent training and talent reserve are the foundation of any enterprise. Obviously, the key to mobilize the enthusiasm of enterprises lies in how to cultivate the reserve talents that enterprises really need through modern apprenticeship. This can be achieved by jointly formulating talent training programs, jointly setting up incentive mechanisms, and signing training agreements between schools and enterprises. At the same time, the government and colleges should go deep into cooperative enterprises, find out the problems existing in the process of cooperation, understand the demands of enterprises, and find solutions. the government can mobilize the enthusiasm of enterprises through various incentive mechanisms and compensation mechanisms; colleges and universities should improve the service quality of enterprises. In addition to the apprenticeship under the

guidance of the master for the enterprise to complete the routine work, more important is the cooperation of college teachers and enterprise engineers.

5.3 Colleges and universities should innovate management and strengthen the construction of " double-qualified " teaching staff.

"Double subject training and dual management" is an important feature of modern apprenticeship. Colleges and universities should fully investigate, analyze specific problems, innovate management, formulate a management system that conforms to the two identities of students and apprentices, and alternates theoretical learning and enterprise post practice, so as to scientifically and reasonably evaluate the learning quality of students ' apprentices. Further improve the modern apprenticeship talent training program, and fully consider the comprehensive training of students ' operational ability, learning ability, communication ability, professional quality and other aspects. Strengthen the construction of ' double-qualified ' teaching staff and improve the ability of college teachers to serve enterprises. In the traditional process of teacher training, colleges and universities pay more attention to the theoretical level and scientific research ability of teachers, which is not conducive to the implementation of modern apprenticeship. Under the modern apprenticeship education system, more attention is paid to the practical ability of teachers, and it is required to keep pace with the times and constantly update new technologies and new skills. This is an objective requirement for guiding students and cultivating students. It is also an objective need to serve cooperative enterprises. Colleges and universities should formulate corresponding incentives and professional title appointment methods to encourage teachers to practice in enterprises, improve their practical ability, and truly realize the " double-qualified " teaching staff.

5.4 Students should emancipate their minds and strive to improve their professional quality.

Students, as the core subject of modern apprenticeship, should emancipate their minds, update their ideas, change the long-standing concern that enterprise post learning will affect the quality of education and teaching, eliminate concerns, rationally view modern apprenticeship, accept modern apprenticeship, and actively participate in modern apprenticeship. From the perspective of their own career development, we should objectively look at the relationship between short-term economic interests and long-term sustainable development. At the same time, we must effectively improve our professional quality, including professional loyalty, professional values, work attitude, work responsibility, etc., so that we can become the skilled talents needed by social production and life, and the high-quality talents needed by the society. This is an important requirement of modern apprenticeship for students.

As an important form of vocational education reform and development, modern apprenticeship has achieved initial results and has been recognized by the government, colleges, enterprises and society. However, modern apprenticeship is a complex systematic project. With the development of society and the continuous updating of educational concepts, it will inevitably face new problems and challenges. We must emancipate our minds, innovate constantly, further explore ideas and practices that meet the requirements of the times, and improve the quality of education and teaching and the level of personnel training.

REFERENCES

[1] the Left Wing, Hsueh. The Practical Dilemma, Practice Direction and Model Construction of Vocational Education Undergraduate Talent Cultivation——— Based on the Perspective of High-level Apprenticeship with Chinese Characteristics [J]. Modern Education Management, 2023, (02).

[2] Ministry of Human Resources and Social Security. Notice of the Ministry of Human Resources and Social Security on the issuance of the "Skills China Action" Implementation Plan [EB/OL]. http://www. gov. cn/zhengce/zhengceku/2021-
07/06/content_562
2619. htm.

[3] Five departments of the Ministry of

Education. Notice on the Implementation of Special Training Plan for Field Engineers in Vocational Education [EB/OL]. http://www. gov. cn/zhengce/zhengceku/2022-11/05/content_5724757. htm.

[4] the wise man. A Study on the Training Model of High-level Apprenticeship [D]. Shenyang Normal University, 2023.

[5] Wang Hui, Zhang Yonglin, Wang Yu Miao. An Analysis of the Participation of British Elite Universities in Modern Apprenticeship——Take Russell Group Universities as an Example [J]. Comparative Education Research, 2017, (07).

[6] Li Mengqing, the rest of the quiet. Logic, Mechanism and Revelation of the Operation of the "Dualistic" University in Germany [J]. Education and Career, 2021(17).

[7] Cai Yue, wish Meng Qi, Zhang Jianrong. A Study on the Development Status and Trend of the "Dual University" Model in Germany [J]. Research in Higher Engineering Education, 2019, (06).

[8] Wu Fang. Study on the Cost Sharing of Higher Vocational Education by Enterprises [D]. Northwest University of Agriculture and Forestry, 2014.

Fault Diagnosis and Maintenance Method of Automobile Powertrain

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Abstract: In order to adapt to the current high-demand automobile market, improve the speed of solving automobile powertrain faults, so as to quickly update automobile models and improve the efficiency of automobile output, this paper gives a brief overview of automobile powertrain. the process of powertrain fault diagnosis and maintenance based on manufacturing base, the analytical thinking of functional fault problem and the quick win scheme of powertrain common fault are summarized. Through technical analysis, the diagnostic maintenance efficiency of automobile powertrain is improved, and the output efficiency of automobile is improved.

Keywords: Powertrain; Fault type; Diagnostic maintenance; Quick win plan.

1. CAR POWERTRAIN COMMON FAILURE

1.1 Common Faults

Powertrain refers to the series of components in a vehicle that generate power and transmit it to the road surface [1]. Powertrain generally refers to the engine, transmission, and other components integrated into the transmission, such as the clutch, front differential, etc. Among them, the engine as the core component of the car, the frequency of failure is relatively high, and the common faults of the engine components are engine management system related failures, harness interference, appearance (damage, poor assembly), oil level excess, engine jitter, engine failure light on, engine stall, acceleration weakness, abnormal sound, oil leakage, air leakage, water leakage, etc. Transmission common faults include electronic oil pump failure, hydrostatic clutch actuator failure, logic control unit signal loss, jitter, R stop no power, gear is not trusted and transmission controller electrical failure.

For the automobile final assembly plant, the root cause analysis of the failure is particularly important, to find the root cause of the failure to solve the source problem. For faults without fault code, it is necessary to check the power transmission path, detect the power source and the functions of various parts and components of the transmission, and use the diagnostic instrument and INCA to collect real-time data of the vehicle for troubleshooting. the fault code can be read directly, and the fault code can be analyzed. For example, if the fault is related to the EMS, the troubleshooting procedure is as follows:

1.1.1 Read the fault code. Use PC diagnostic instrument to enter the EMS module, read software version information, record the basic situation of the vehicle, query the fault code, understand the relevant working conditions according to the fault code, determine whether it is the current fault, if it is a historical fault, combined with whether the working conditions can be repeated, then query the fault diagnosis strategy, and read the data flow.

1.1.2Stitch & appearance check. After the conventional fault is confirmed and the fault logic is completed, the bullet train investigation link is entered. For accidental faults, each disassembly step needs to be purposeful, and cannot be blindly disassembled to prevent the recurrence of faults. the open-circuit problem can generally be eliminated by skewness of the pin and missing inspection.

1.1.3 Harness measurement. Routine measurement of wiring harness or voltage measurement; If the conventional method can not eliminate the fault, the oscilloscope can read the waveform discrimination.

1.1.4Sensor measurement. Routinely test the resistance inside the sensor or test the voltage. the test data can be benchmarked against normal vehicles.

1.1.5 ABA verification. ABA is A verification method that starts with state A, changes to B after adding variables, and changes back to A

after eliminating variables. Validation can narrow the scope of the fault, for open faults or easy to troubleshoot faults can skip wire harness measurement and sensor measurement, can be directly ABA validation.

1.2 Fault Case 1: the OCV is stuck

Automobile fault phenomenon: the road test shows that the engine failure light is steady on. Through the pre-factory inspection, the detected fault code is P001778, that is, the relative position deviation of the exhaust camshaft is too large.

Fault cause analysis. Due to the oil control valve operation stuck or variable timing valve stuck, will report unreasonable phase or VVT stuck and other faults. Fault analysis: (1) Fault detection: ① screen surface state check, no foreign body blockage; ② Power/resistance detection, no stuck phenomenon; (2) Disassemble and check the valve sleeve: inside the valve sleeve, there are traces of foreign body stuck, there is foreign body stuck phenomenon; Observe the appearance of the reversing rod, no obvious scratches; Cleanliness test: the maximum metal particle is $332 \times 35\mu m$ ($\leqslant$ $600\mu m$). (3) Troubleshooting: ① Assembly process troubleshooting: After installing the OCV valve, the OCV valve installation station should also assemble the front hook and timing chain cover bolts, and there is a risk that foreign objects in the bolts and hooks will enter the OCV valve. ② Check the cylinder head machine adding process: the cleanliness of the oil passage after the cylinder head assembly is offline has large particles of aluminum chips, the cleaning effect is not good, and there is the risk of entering the OCV valve; (4) Root cause determination: the OCV valve adjusts the position of the reversing rod according to the ECU instruction, thereby controlling the VVT opening and finally controlling the relative Angle of the camshaft and crankshaft. If the OCV valve operation or VVT is stuck, the phase is unreasonable or the VVT is stuck. In summary, it is concluded that the fault is caused by foreign bodies in the cylinder head oil passage.

Rectification measures: (1) Shift the installation station of the OCV valve to ensure that the assembly of the position does not touch other parts; (2) Change the OCV oil hole cleaning from turbulent flow to fixed point cleaning, and the pressure is set at 10bar; (3) Add a brush to deburr the intersection of the oil hole and the main oil passage of the cylinder head.

1.3 Fault Case 2: GA assembly failure

Car failure phenomenon: After the service station feedback sales to the customer, the customer feedback reverse gear without power output, accelerate the start speed rise, no reverse gear.

Fault cause analysis. Fault analysis: (1) Fault verification: the service station detects that the engine fault light is on, the transmission light is off, there is no abnormal running, and the engine system fault code is P27661, that is, the rotation direction of the input shaft 2 is wrong; P073300 that is, the 3 gear ratios do not match. Service Station Road test: the instrument reports deceleration, fault light, hanging reverse gear, idling car does not move, there is a sense of slip, the service station replaces the shifting motor actuator, troubleshooting; (2) Fault detection: the height of the finger sleeve end face to the shaft end face is abnormal (the measured value is 62.53mm, the reference value is 59.35 ~ 60.8mm), which belongs to the known finger pressure deviation problem; (3) Cause analysis: the original process is that the shaft and the finger are manually assembled and put into the tooling, resulting in the displacement of the shaft and the finger when the designated position surface is not attached to the tooling, causing the problem, and the original equipment does not have the error prevention function to ensure that the shaft positioning surface is attached to the tooling.

Rectification measures: (1) Before GA packaging, use a caliper 100% to check that the distance between the end face of the dial rod and the dial finger end is less than 60.4mm; (2) the positioning surface of the shaft spline section should be close to the tooling, the finger should be placed into the finger tooling, and then pressed, and the finger pressing and testing station increase the requirements to confirm that the shaft reference end face is flat to the tooling plane; (3) Add a limit sensor in the riveting press station; (4) Increase the sensor at the check station to ensure that the product with pressure bias can be detected.

2. DIAGNOSTIC MAINTENANCE PROCESS

In automobile final assembly plant, the process of automotive powertrain diagnosis and maintenance includes six parts: information feedback, fault recheck, collaborative analysis, horizontal expansion, information sharing and technical improvement. the technical department receives the fault information from the market, road test, and line test feedback, and the technical personnel re-inspect the faulty vehicle under the same conditions through the feedback fault information. the specific process of the re-inspection usually includes:

2.1 Confirm the type of the detection object, determine the relevant parameters of the detection object, detection method, and detection process.

2.2 Establish the detection equipment database of the corresponding model of vehicle. In order to solve the problem (determine the connection of the line, measure relevant parameters and collect real-time data, etc.), the special software (such as Yinka) and special tools need to be selected for vehicle calibration, such as: Tool box, flashlight, electric tester, multimeter, INCA, automobile production line tester test bench, torque wrench, coordinate gear meter, tape measure, vernier caliper, anemometer, tire pressure meter [2], gauge, lap wire, tension meter, diagnostic instrument, endoscope, etc.

2.3 Data sorting and analysis, rearranging the collected data, eliminating the interference content, and analyzing it with appropriate algorithms to determine the cause and location of the failure, and organizing targeted tests artificially [3].

2.4 State judgment and prediction. In this process, it is mainly to determine the operating status of each component and determine whether batch risks occur. After re-checking and confirming the fault, analyze the root cause of the fault (serious problems need to organize the power company, R & D department or suppliers to jointly investigate), after determining the root cause of the fault, give corrective measures and carry out horizontal expansion, and finally feed the information to the technical R & D department, the technical R & D department will make technical improvement through the feedback information.

3. FUNCTIONAL FAULT PROBLEM ANALYSIS THINKING

Automotive powertrain failure is generally divided into six categories, of which the most common, most complex and most likely to cause customer complaints is the functional class problem, therefore, the functional class problem is more urgent to deal with, for the functional class problem analysis ideas are as follows:

3.1 In-depth investigation of the status quo: the status quo investigation and analysis of the functional problems of the vehicle is a very important link, and the problem of the power function is often not a single performance. Such as: acceleration is weak, usually the power system in the instrument abnormal warning failure lights or throttle failure will be triggered, the root cause may be blocked by foreign bodies in the exhaust pipe.

3.2 Root cause analysis: Under normal circumstances, the fault code can be detected. In the fault code detected by electrical problems, the "loss of communication fault" is generally the vehicle wiring harness or the engine/transmission wiring harness is off or the terminal is abnormal, which can usually be replaced. For the fault without fault code, it is necessary to check the power transmission path, power source, transmission parts and functions, and use the diagnostic instrument and INCA to collect real-time data of the vehicle for investigation. After locking the faulty part or assembly, send it to the supplier for professional testing (EOL test, coordinate, function test bench) to give the cause of the failure.

3.3 Develop corrective measures according to the cause of the failure.

4. POWERTRAIN QUICK WIN SOLUTION

The quick-win scheme is the one with the highest efficiency and the best result. For the automobile final assembly plant, under the premise that the root cause of the failure has been clear and the countermeasures can be implemented permanently, the quick-win scheme can be adopted to ensure that the failure problem can be dealt with quickly and effectively and improve efficiency. the quick-

win scheme under common failure modes is implemented as follows:

4.1 Cannot start. When the cause of the failure is spark plug fire, fuel pump fire, starter corrosion, the quick win scheme is usually used to replace the engine spark plug, replace the fuel pump, and replace the starter, but it is necessary to pay attention to the need to re-test the vehicle after replacement, and repeatedly confirm the start.

4.2 Fuel leakage. When the fault occurs because the quick plug is faulty or the oil pipe is damaged, the quick win solution is to replace the quick plug/oil pipe, and keep away from the fire source during replacement.

4.3 The fault light is on. If the causes of the fault are OCV valve stuck, oxygen sensor failure, carbon tank solenoid valve stuck, fuel leakage diagnosis module current out of range, and evaporation system leakage, use the quick win solution to replace the OCV valve, oxygen sensor, carbon tank solenoid valve, DMTL, and smoke detector to detect leakage points. During replacement or detection, follow the repair guide.

4.4 Poor acceleration. When the fault is caused by throttle position deviation, adjustment limit (throttle foreign matter blockage) supercharger rear end intake pipe leakage, the quick win solution is to disassemble the intake pipe and take out the throttle foreign matter, find the leak point and reinstall it. In the face of foreign matter problems, it is necessary to confirm the source of foreign matter and conduct horizontal investigation.

4.5 Transmission oil leakage. Transmission oil leaks are usually caused by oil leaks in the transmission differential seal. This kind of failure quick win program usually uses the replacement of the differential oil seal or half shaft, and after replacement, attention needs to be paid to clean the residual oil to avoid false oil leakage in the market, leading to customer complaints.

4.6 High water temperature. When the failure is caused by the leakage of antifreeze, the failure of electronic fan, and the failure of thermostat, the quick win way is to find the leak point, replace the corresponding parts, and replace the electronic fan and thermostat. It is important to dispose of the residual liquid.

4.7 Abnormal engine jitter. When the engine jitter is caused by spark plug fire and fuel injector failure, the quick win scheme is used to replace the faulty parts, and it is necessary to pay attention to the road test to confirm that the fault is repaired.

4.8 The car is not in gear. the transmission does not move the car is generally caused by HCA failure, the solution used is to replace the HCA, it should be noted that after the replacement, it needs to learn (brush software).

4.9 The vehicle cannot be put into gear. the failure of the vehicle to mount the gear is usually caused by the failure of the electronic gear shifter, the scheme used is to replace the electronic gear shifter, and the electrical inspection needs to be carried out again after replacement.

4.10 Abnormal oil consumption. If the failure is due to the supercharger oil leakage or oil into the cylinder combustion, the supercharger needs to be replaced, and the road test after replacement needs to be tracked and verified to observe the exhaust gas color.

5. CONCLUSION

In the automobile manufacturing base, the automobile fault is dealt with by six steps: information feedback, fault verification, root cause analysis, determination of rectification measures, information sharing, and technical rectification. It is analyzed that the base powertrain failure is mostly caused by the imperfect assembly process and non-standard operation, and it is more necessary to standardize the assembly operation behavior and improve the process flow. As the core component of automobile, powertrain fault diagnosis and maintenance technology is the most important part of the root cause analysis of the fault, the fault of the powertrain presents complex and diverse characteristics, at this stage, it is divided into six categories, through the normalization of fault diagnosis and maintenance steps, to provide a quick solution to the problem of powertrain fault. At the same time, quick-win schemes improve output efficiency.

REFERENCES

[1] ZHANG H J, ZHU C, SUN L. the hybrid powertrain of both test vehicles is reliable Comparison of methods of performance [J]. Automotive Practical Technology, 2017, 42(4):84-88.

[2] LIU J P. Experimental study on the morphology and production mechanism of tire wear particles [D]. Ningbo: Ningbo University, 2018.

[3] LIU D M. Exploring Fault Diagnosis Technology of Automotive Power System [J]. Automotive & Driving Maintenance (Maintenance Edition), 2017, (9):88, 90.

Design of Portable Automated Testing System for Real Vehicle Functions

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Abstract: With the rapid advancement of automotive electronics, the capabilities of automotive electronic devices are becoming increasingly diverse and complex, leading to a growing workload in real vehicle functional testing. To alleviate the difficulty of this testing, enhance efficiency, and ensure accuracy, we introduce a portable automated testing system tailored for real vehicle functions. This system is capable of importing test cases to generate automated test sequences, guiding the driver through the steps of operating the actual vehicle via voice broadcasts, and subsequently determining test results and generating a test report [1-2]. This system enhances testing efficiency and accuracy, while reducing testing costs and execution difficulties.
Key words: Portable, Real Vehicle Functions, Voice Broadcast, Automated Testing

1. INTRODUCTION

With technological advancements, the automotive industry has seen rapid growth in recent years, particularly in domestic independent brand vehicles. In terms of chassis power and body comfort, the technological gap with internationally renowned brands is gradually narrowing. As domestic independent brand vehicles gain prominence, competition among domestic automakers has intensified. To gain a competitive edge in the domestic brand car market, manufacturers are intensifying their research and development efforts, diversifying vehicle configurations, and shortening the development cycle of vehicle models. However, the launch of new models brings an increased risk of vehicle issues. Therefore, during the transition from trial production to mass production, real vehicle testing holds a crucial position. Effective testing can minimize vehicle problems, and superior testing equipment enhances testing efficiency. Nevertheless, most automated functional testing equipment consists of large HIL systems used in laboratories, while portable automated functional testing equipment for real vehicles remains uncommon.

This article designs a portable real vehicle function automation testing system, which is an automated testing system based on NI software and hardware platform and speech synthesis platform [3]. Applying this system to real vehicle testing can improve testing efficiency and reduce testing costs.

2. OVERVIEW OF THE OVERALL SYSTEM FRAMEWORK

The system mainly consists of three parts: a hardware platform with cRIO as the core, a speech synthesis module, and an upper platform management software. the portable testing system described in this article mainly includes an upper computer and portable testing equipment. the upper computer uses a portable laptop and develops upper management software using LabView programming language. Test information and test sequences are configured through Excel spreadsheets, imported into the upper management software to generate test sequences and execute tests; During the testing process, interaction with the testing personnel is carried out through voice synthesis instructions. After the testing personnel execute the voice prompt instructions, the upper software automatically determines whether the CAN bus signal value of the corresponding function is the same as expected; After the test is completed, the upper software automatically generates a test report. the upper computer is connected to the testing equipment through Ethernet and can display the CAN bus signals collected by the testing equipment and their analytical values in real time.

The portable testing equipment mainly includes cRIO chassis, cRIO-9853CAN board, cRIO-9866LIN card, cRIO-9211 acquisition card, and power supply module. Among them, the cRIO chassis serves as the carrier and lower computer of the CAN board, which can monitor various CAN information of the vehicle, and the power supply module supplies power to the chassis.

3. SYSTEM HARDWARE AND SOFTWARE

3.1 Automated Testing Hardware Platform

The CompactRIO system consists of a controller containing a processor and a user programmable FPGA, as well as one or more signal conditioning I/O modules provided by NI or third parties. the cRIO-9064 module is a 4-slot controller with a 667MHz dual core CPU, 512MB DRAM, and 1GB storage capacity for data recording; Can be used as a lower computer to communicate with the upper computer through a network port; the upper software can be developed and designed using LabView.

NI-9853 is a high-speed CAN module for CompactRIO, which can communicate with devices at a speed of up to 1Mb/s. By utilizing the flexibility and high performance of the CompactRIO platform, NI 9853 can run synchronously with any CompactRIO I/O module and provide CAN and data acquisition hardware synchronization with a resolution of 25ns. the main function of this system is to collect real-time bus data from actual vehicles through this module, and perform data filtering and processing analysis through system software.

The LIN card is NI-9866. This module is a local Internet interface. Combined with the NI-XNET driver application program, the monitoring program of LIN signal can be developed. During the real vehicle test, LIN bus data can be collected in real time through this module. NI 9221 is a C-series module designed for high-speed measurement with a range of ± 60V; This wider voltage range makes the module very suitable for automotive grade battery measurement. This module is mainly used for hard wired data collection of abnormal functional items during actual vehicle function testing, and for data analysis through system software to locate

problem points. the module parameters are as follows: 8 single ended channels, 800ks/s sampling rate; ± 60V measurement range, 12 bit resolution; 250Vrms channel grounding-Operating at 40 ℃ to 70 ℃, 5g vibration, 50g impact.

3.2 Automated testing software platform

The software introduced in this article is a real vehicle automation testing software developed using LabView programming language. the software is divided into three layers: the first layer is the interaction layer, which inputs configuration testing information, displays the testing process and results, and generates reports; the second layer is the execution layer, which includes the sequence and logic of the testing process (testing process. VI), data processing, and testing evaluation; the third layer is the driver layer, which controls the signal acquisition of the control board. the main function is for users to configure hardware using software, import test cases, generate test sequences, and execute tests. During the execution process, the software automatically collects and determines the data that needs to be monitored in the test cases, and finally generates test reports for testing engineers to analyze.

3.2.1 Software Interaction Layer

The interaction layer of the software mainly consists of human-computer interaction, including user login interface, test software main interface, test case editing interface, test data analysis interface, and speech synthesis module.

User login is mainly used to log in and manage permissions for various testing engineers, who are responsible for different vehicle models; Different vehicle models have different test cases, which makes it easier to manage the testing project.

The main interface of the testing software is the core of the interaction layer, which mainly displays three parts: testing project management, testing sequence management, and real-time display of testing data. Among them, testing engineering management is mainly for testing engineers to manage their own testing vehicles, and different vehicle testing tasks can be created in the software; Test sequence management is mainly used by test engineers to generate test sequences after importing Excel test cases. At the same time,

test engineers can also check the need to execute test sequences; Real time display of test data is to enable testing engineers to view the test data in real-time during the testing execution process.

The test case editing interface is mainly designed to facilitate test engineers to add test sequences online or quickly modify test sequences; At the same time, it also supports exporting test sequences as Excel files, which can quickly add or modify sequences to the test case library.

The main purpose of the test data analysis interface is to display digital data in waveform form on the same timeline, making it easier for testing engineers to analyze multiple data simultaneously. the speech synthesis module is mainly used for interaction with testing engineers during the execution of automated testing systems. the biggest difference between real vehicle testing and HIL testing is that the input terminals in real vehicle testing are both operated by real switches; In HIL testing, the input terminal mainly simulates switch operations, which makes it more difficult to perform automated testing for real vehicle testing. Therefore, this software can prompt the testing engineer to perform actual vehicle operations through voice playback of the testing steps in the test cases.

3.2.2 Software Execution Layer

The software execution layer mainly includes two modules: logic processing and data processing. the software execution layer passes the data in the logical steps input by the user to the driver layer, and at the same time, passes the data collected by the driver layer to the interaction layer for real-time display.

The logic layer module clearly defines various execution scenarios of software when executing user input test sequences, as well as some rules that restrict users from writing test sequences, making the execution efficiency and accuracy of test sequences higher. the data processing module mainly filters the collected test data, compares it with the expected values of the data that needs to be monitored defined by the user, and finally outputs the test results to be displayed in the test report.

3.2.3 Software Driver Layer

The main function of the underlying driver module in this software is to collect hard wired and bus data for the entire vehicle system.

During the test execution, the corresponding driver module is called to return the data that the user needs to collect and judge through the data processing module.

4. TEST EXECUTION AND RESULTS

According to the testing requirements, connect the hardware of the testing system to the actual vehicle bus and hard wire channel. the bus connects the actual vehicle to the equipment through OBD and DB9 adapter wires, and the hard wire connects the hard wire port of the controller that the user needs to monitor to the equipment through a harness. Open the testing software, log in and click 'Run' to create the testing vehicle model/task on the left side of the interface; And divide the test sequence according to the functional system under the vehicle model/task for easy management. Select the test case management module, and the "Select Test Case Document" window will pop up. Select the test case document that needs to be imported. Select the database management module, the "Select Database" window will pop up, and select the database file that needs to be imported. After the configuration is completed, you can select the test items to be executed by clicking on the "selection box" in the window, and click the "start" button to start the test. the software will execute the test steps through voice broadcasting; the driver performs actual vehicle operations through voice prompts, and the software judges based on the I/O and bus signals that need to be judged in the sequence through the evaluation time window and evaluation logic. During the test execution process, the driver can also stop the test execution by pressing the pause or end button for emergency handling.

After the testing is completed, a test report is automatically generated, and the testing engineer analyzes it based on the test report. the entire execution process was carried out by only one driver, with a total of 156 test sequences executed. 133 passed and 23 failed, taking a total of 93 minutes and 27 seconds; Traditional manual real vehicle testing requires one driver to operate and one testing engineer to manually evaluate the accuracy of the data. Executing a sequence takes approximately 1-2 minutes, totaling approximately 234 minutes. Therefore, this

testing system not only has an advantage in terms of personnel quantity, but also greatly improves the efficiency of testing execution and reduces testing costs.

5. CONCLUSION

With the diversification and rapid transformation of domestically developed vehicle models, actual vehicle testing work has become increasingly heavy, requiring a large number of engineers with testing experience. the use of this system reduces the experience requirements for engineers; the design of front-end test cases and analysis of back-end test reports can be carried out by professional testing engineers, who are only responsible for design, development, and analysis; Ordinary engineers or drivers familiar with the vehicle can carry out testing and execution with this system, and after execution, send the report to the testing engineer for analysis. According to the comparison of execution process data, the system has reduced the cost of actual vehicle testing and improved the efficiency and accuracy of actual vehicle testing in practical use.

REFERENCE

[1] Li Lu, Cai Yongxiang, Shi Yanlei, et al. Design of Automated Diagnostic Testing System for Automotive Electronic Control Units [J]. Times Automotive, 2022, (07):147-150

[2] Dang Meiting. Research on Hardware in the Loop Testing of Electric Vehicle Controllers and Motor Controllers Based on dSPACE [D]. Chang'an University, 2020

[3] Gao Song, Tang Peng, Sun Binbin, et al. Design of Power System Test Platform for Dual Motor Driven Electric Vehicles [J]. Journal of Henan University of Science and Technology (Natural Science Edition), 2017, 38(05):20-24+4

Analysis on the Application Status of Big Data Technology in University Audit Work

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Abstract: With the continuous development of the new generation of information technology, the amount of information data in all walks of life has been increasing in recent years, and the application scenarios of big data and cloud computing technology have become more and more extensive. Using information technology to analyze and process large amounts of data has become a new skill and requirement for audit work, as has the internal audit of universities. In order to meet the requirements of the new era, promote the construction of university audit informatization with big data as the core, and realize the full collection of all kinds of major economic information data inside and outside the university, most of universities have basically built a digital audit and analysis platform. However, in actual use, due to the constraints of data quality and personnel digitization level, the platform has not played its due role, and there is still much room for improvement and improvement.
Key words: Big data tchonology; Audit in university; Digital audit and analysis platform

1. NECESSITY OF BIG DATA AUDIT IN UNIVERSITIES

1.1 Respond to growing business data demands.

With the continuous expansion of the scale of colleges and universities, the scale of annual funds has increased significantly, and the scale of annual funds of many subordinate colleges and universities has exceeded 10 billion yuan. At the same time, there are many affiliated units such as school-run enterprises, research institutes, hospitals and so on. This makes the internal audit institutions of colleges and universities need to deal with a large number of data and a variety of types every year, which has caused great pressure on the smooth development of audit business. Big data audit can effectively deal with this challenge, through the rapid and accurate processing and analysis of massive data, improve the efficiency and quality of audit.

1.2 Improve audit quality and efficiency.

The big data audit model can make comprehensive use of data and improve the efficiency of checking problems. Through the collation and analysis of data, mining a large number of potential information of relevance and trend, and carrying out omni-directional, three-dimensional, multi-angle and multi-dimensional description and evaluation judgment, it is helpful to reduce audit risk and improve audit efficiency. In addition, big data audit can also promote the change of audit procedures, from sampling audit to comprehensive audit, continuous audit, from accurate digital audit to data audit, from traditional audit analysis methods such as factor analysis to big data analysis, so as to further improve audit quality.

1.3 Achieve full audit coverage.

The proposal of "full audit coverage" requires that the internal audit of colleges and universities cover all business and all departments (units). However, the existing internal audit resources alone will not be able to accomplish the required tasks. Big data audit can break the information barriers among universities and departments within universities, and achieve comprehensive coverage of audit objects. Through the comprehensive analysis of all kinds of business data, we can find potential risks and problems, and provide comprehensive audit evidence support for the internal management of colleges and universities.

1.4 Promoting the Process of Audit Informatization.

With the gradual increase of national education funds, the supervision of the use of funds by the competent departments is becoming more and more stringent, and the awareness of risk provention and control of

various businesses in Colleges and universities is increasing. In order to promote the big data audit mode, the internal audit of colleges and universities should make full use of the information platform to carry out the work, and build a management platform that integrates project management, data extraction, special analysis and other functions. This can not only strengthen the management of internal audit process, strengthen the construction of internal control, prevent all kinds of risks, but also promote paperless office, strengthen the model management of all kinds of audit application documents and the establishment of audit knowledge base, improve work efficiency and reduce audit costs.

1.5 Promote the re-creation of audit concept.
Big data audit is not only an innovation of technical methods, but also a recreation of audit concepts. It requires internal auditors in colleges and universities to change from knowledge-driven, experience-driven to data-driven, and in the face of massive data, they need not pursue the "accuracy" of small data, but should examine problems from a macro and global perspective, find audit clues and use big data analysis to draw scientific and reasonable audit conclusions. This change of audit concept will promote the development of internal audit work in colleges and universities to a more scientific and efficient direction.

To sum up, the necessity of carrying out big data audit in colleges and universities is reflected in many aspects, such as coping with the growing demand for business data, improving audit quality and efficiency, achieving full audit coverage, promoting the process of audit informatization and promoting the re-creation of audit concepts. These advantages make big data audit become the development direction and future trend of internal audit work in colleges and universities. Based on the above reasons, it is very important to strengthen the application of big data audit in the internal audit of colleges and universities. In recent years, colleges and universities have also built a digital audit and analysis platform, which has improved the quality and efficiency of audit, found potential risk points in time and carried out effective provention and control, and achieved good results.

2. SEVERAL FACTORS RESTRICTING BIG DATA AUDIT IN UNIVERSITIES AT THE PRESENT STAGE

2.1 The quality of information obtained by the big data platform is not high, and the data still need to be collated and checked manually.
Mainly in the following aspects: First, due to factors such as confidentiality, some information, especially important information such as finance and personnel, can not be shared through the big data platform, resulting in incomplete data on the big data platform, Relevant data still need to be obtained separately by auditors, and then collated and tested manually. Second, the school each data platform lacks the unified data format. As a result, the format of data obtained by audit is confused, errors are prone to occur in the process of data conversion, and it is difficult to transform into the standard format required for screening, which affects the quality of audit data acquisition. Third, there is a lack of verification among the data platforms in universities. Due to different statistical calibers or human errors in data entry management, the data obtained by big data platforms from two or more systems are often inconsistent, which requires auditors to verify and verify manually, thus hindering the implementation of audit work.

2.2 The big data audit team is not skilled in business and has audit shortcomings.
Mainly in the following aspects: First, the audit department is not skilled in big data audit business. For big data technology, auditors are mostly in the stage of learning while auditing, and the phenomenon that auditors are not familiar with the business is more serious. Second, there is a lack of compound talents. Although audit departments have paid more attention to the introduction of computer professionals in recent years, there is still a widespread phenomenon of "two skins" between auditors and computer audit technicians in audit departments. Those who can write analytical statements are not familiar with financial and related business knowledge, lack strategic thinking, audit thinking is not open enough, lack of work experience, and can not analyze problems from multiple perspectives; Experienced auditors are unable

to write analytical statements and apply audit concepts to electronic data, resulting in an inability to maximize the value of the data.

2.3 Data security needs to be improved, and there is a risk of data leakage or tampering.
Big data audit designs a large number of sensitive data, such as financial data, personnel data, etc. Once leaked, it will bring serious losses to colleges and universities. Data leakage may be caused by improper human management, system vulnerabilities and other reasons. Mainly displays in: First, the technical security risk. Big data audit requires the use of various data analysis technologies and algorithms, and if the technology is not secure enough, it may be subject to the risk of hackers and data tampering. Technical vulnerabilities and flaws can become points of entry for attackers, leading to data leakage or destruction. the two is storage and transmission risk. There are also risks in the process of data storage and transmission, such as storage media damage, data loss, data leakage and so on. These risks may be caused by the quality of storage media, storage environment, network transmission security and other factors. Third, personnel risk. Big data audit requires high-quality professionals, if the quality of personnel is not high or professional enough, such as operational errors, illegal operations, lack of safety awareness, etc., may affect the standardization and effectiveness of the audit process.

3. COUNTERMEASURES FOR BIG DATA AUDIT IN UNIVERSITIES AT THE PRESENT STAGE

3.1 Strengthen ideological change and lay a solid foundation for big data audit.
Big data audit has become an important part of audit work, and university management and auditors should fully recognize the importance and necessity of big data audit. University management should take big data audit as an important means to improve school management level and prevent risks. Auditors should change the traditional audit concept, establish data-driven big data audit thinking, pay attention to the core role of data analysis in audit work, and continue to promote the integration of audit business and information technology. In combination with the work of

economic responsibility audit of leading cadres, budget execution audit and special audit of project funds, we should do a good job in data collection, collation and analysis, promote the establishment and improvement of data management mechanism, sort out mature technical methods and typical experience practices, and promote them so as to realize the sharing of information resources and experience.

3.2 Strengthen data management to ensure the authenticity of data from the source.
One is to do a good job of data entry. Whether it is financial software, personnel management software or other software systems of the department, the relevant departments should input information in a timely and accurate manner, insist on not empty columns, many columns, especially personnel ID card information, carefully check, carefully check, can not appear errors, omissions and other issues, to ensure the accuracy of information input, only in this way can we ensure the authenticity and reliability of audit information. the second is to do a good job of data backup. the stability and security of the information management system should have extremely high reliability, ensure the security of the original data when the information management suffers from hardware or system failures, virus attacks and other situations, and restore the data in a short time to ensure the security of the information data and provide the most authentic information for the audit.

3.3 Strengthen cooperation among school departments and share information resources.
First, the audit department takes the initiative to strengthen communication and cooperation with various functional departments in the school to obtain the necessary audit data and information resources, so as to grasp the data more comprehensively and achieve full coverage of the data. Second, theaudit department should be combined with the information department, Jointly promote cross-departmental data sharing and integration, break down information barriers, and provide comprehensive and accurate data support for big data audit.

3.4 Strengthen team building and train a team of compound audit talents.
Auditors should not only understand the

knowledge of big data, but also understand the audit practice, and constantly improve the quality of auditors'computer audit business through various ways. First, actively organize and participate in professional training. Actively participate in the training courses of big data audit held by superiors, continuously improve the technical means and audit ability of big data, and enrich the theoretical knowledge and practical operation skills of auditors. The second is to strengthen internal communication. By carrying out project audit, auditors can learn from each other, exchange and communicate the experience of big data audit, improve the thinking ability of auditors, and also take the form of big data audit exchange meeting to share and summarize the experience of big data audit, learn from each other's strengths and complement each other's weaknesses, broaden their horizons, unify the ideas of big data audit, and stimulate the enthusiasm and creativity of cadres to explore big data audit. The third is to formulate a training plan for big data talents. According to the annual audit project plan, the audit department can formulate a big data training plan, focusing on planning the training objectives, personnel, time limit of project auditors, and the results achieved through big data audit. It can also be combined with the actual situation, through the old with the new,

to the superior or brother units to learn and other forms of training, focusing on learning big data audit workflow, audit methods, organizational forms and so on.

4. CONCLUDING REMARKS

In short, big data audit achieves cross-industry, cross-domain, cross-regional, multi-dimensional and multi-level audit, which makes it easier to find complex and hidden problems, and provides early warning and preventive measure for common problems and trends. Continuously improve audit efficiency, give full play to the role of big data audit, comprehensively guide university auditors to deeply understand that big data audit is the inevitable trend of future audit development, and consciously conform to the trend to adapt to the requirements of the new era of audit.

REFERENCES

[1] Zhang Hong; Wang Hongbo; Qiao Yu; Research on the construction of government audit informatization under the background of big data——A case study of W City [J]. Market Weekly, 2024:07

[2] Wang Shan; Reshaping Audit Services with Data-Driven Audit [J]. the Chinese Certified Public Accountant, 2022:05

A Study on The Impact of Local Ecological Culture on Sustainable Livelihoods of Rural Tourism Farmers

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Abstract: This thesis selects Chaganhutun as a case, based on the actual development of tourism in Chaganhutun, constructs a comprehensive evaluation index system from seven aspects, such as ecological capital, cultural capital, natural capital, and material capital, etc., and analyzes the impact of ecology and culture on the sustainable livelihoods of farmers by using PRA method to obtain the first-hand data data of farmers in Chaganhutun, and adopting entropy method to calculate the weights of each index.
Keywords: Ecological Culture; Rural Tourism; Sustainable Livelihoods of Farmers; Chaganhutun

1. INTRODUCTION

Rural tourism has become the focus of rural development, and local ecological culture plays a pivotal role in promoting the vigorous development of rural tourism and facilitating the sustainable upgrading of farmers' livelihoods. To study the sustainable livelihood of tourism farmers in rural areas: on the one hand, local ecological culture can attract tourists and enhance the attractiveness of rural tourism farmers' livelihoods; on the other hand, local ecological culture can be an innovative point for rural tourism farmers' livelihoods. Chaganhutun is strategically located in the heart of Northeast China, at the western edge of the Songnen Plain, and has unique natural resources, such as clear lakes, fertile land, and diverse flora and fauna. Meanwhile, the local ecological culture of Chaganhutun is unique and rich, encompassing many aspects of traditional farming culture, fishing and hunting culture, and Manchu culture. With the rapid development of rural tourism, how to realize the sustainable development of rural tourism while protecting the ecological culture and natural environment has become an important challenge for the local area. Therefore, this paper chooses Chaganhutun as the research object to reveal the important role of ecological culture in the development of rural tourism through the study of the impact of local ecological culture on the sustainable livelihood of rural tourism farmers in this region.

2.. LITERATURE REVIEW
1.1 Livelihood capital

Shen et al. (2008) proposed sustainable livelihood framework for tourism (SLFT) after modifying the DFID framework, replacing physical and financial capital with economic capital and introducing institutional capital to put the sustainability of farmers' livelihoods in the context of tourism [1]. Karki (2013) used Badia National Park in Nepal as an example to illustrate that putting environmental protection at the center has a positive impact on improving sustainable livelihoods of farm households [2]. Darban Astane (2018) suggested that rural tourism diversifies farm income and improves livelihoods of farm households [3]. However, rural tourism does not always have a positive impact on the livelihood capital of farm households; Hu Xin (2019) constructed a corresponding indicator system based on three major economic, social, and ecological systems to study the impact of ecotourism on the vulnerability of farm households' livelihoods, as well as the factors contributing to such impacts [4]. with regard to the research on the assessment of ecotourism on the livelihood capital of farmers, Ding Huimin et

al. (2019), in their study of the Qinling ecotourism area conducted an in-depth investigation, found that there were significant differences in the five livelihood capitals of farm households, based on which suggestions were made to further improve infrastructure, attract foreign investment, increase the way farm households earn income, implement tax reduction and exemption policies, establish community service associations, and improve rural financial channels [5].

2.2 Livelihood strategies

Sanjay (2009) discusses Annapurna's dependence on tourism and argues that tourism has a high impact on the livelihoods of local farm households [6]; Mbaiwa (2011) suggests that tourism changes traditional local livelihood activities and lifestyles by studying community-based tourism develop ment in Botswana, leading to the diversification of farm households' livelihood capitals and modernization of farm households' livelihoods, for example, modernized lifestyles [7]; Mbaiwaa J E (2013) studied the Natural Resource Management Project (CBNRM) in Botswana's Biodiversity Region arguing that the transformation of livelihood strategies improves the livelihoods of farm households and meets basic needs such as housing, employment, and transportation [8]; Zhang Yunjun et al. (2012) used a quantitative methodology to investigate the effects of survival of the farmers of Wangjiazhai, a village in the vicinity of Baiyangdian, Hebei, and found that Baiyangdian tourism in terms of infrastructure development, service quality improvement, and environmental awareness enhancement, as well as the constraints faced by farmers' households in participating in ecotourism development in terms of shortage of human, financial, and social capital [9]; Different research objects and methods show that ecotourism is positively related to community and farmers' livelihood outcomes. After investigating the livelihoods of farm households around protected areas using the propensity score matching method, Ma Ben et al. (2016) concluded that participation in ecotourism has a positive effect on net per capita income and non-farm income of farm households. However, the role of ecotourism in environmental education and community participation in conservation needs to be

further strengthened [10].

3. RESEARCH METHODS

In this paper, PRA was used in Chaganhu Tun, the case site, to conduct field research in two or more sessions of about one week each, depending on the sample collection needs, by means of household, semi-structured interviews, questionnaires, etc., to obtain the livelihood status of the local residents, and to grasp the livelihood strategies adopted under the existing livelihood capital [11]. the entropy value method is used to determine the weights of the indicators and calculate their scores. As an objective method of assigning values, the entropy value method has the characteristics of clarity, objectivity and simplicity, and the entropy value method score can be used to calculate the importance of different indicators under a certain value. In this paper, in order to avoid the interference of subjective factors, the entropy value method is utilized to determine the weights and scores in order to reflect the objective authenticity of the results more accurately. the steps are as follows:

3.1 Data standardization:

$$P_{ij} = \frac{X_{ij} - \min\{X_j\}}{\max\{X_j\} - \min\{X_j\}}$$

(2) Calculation of the proportion of each indicator: $f_{ij} = P_{ij} / \sum_{i=1}^{n} P_{ij}$

(3) Calculate the entropy value of each indicator:

$e_j = -K * \sum_{i=1}^{n} f_{ij} \ln f_{ij}$ □ including $k = 1/\ln(n)$

(4) Calculation of the utility value of each indicator: $r_j = 1 - e_j$

(5) Determination of the weights of the indicators: $w_j = r_j / \sum_{j=1}^{m} r_j$

3.2 Experimental implementation

This paper takes Chaganhu Tun as the research object, and the questionnaire is designed in two parts. the first part is the basic family information of the farmers, including the age of the farmers and the monthly income of the family in 2 questions. the second part is the livelihood capital questionnaire of rural tourism households, including ecological capital, cultural capital, natural capital, physical capital, financial capital, social capital and human capital, seven dimensions totaling 24 items. Based on the research data, the livelihood capital status of rural tourism

households in Chaganhutun is evaluated.

3.3 Analysis method

This paper constructs an indicator system based on the theory of sustainable development, livelihood theory and the actual needs of farmers. Through in-depth research on rural tourism farmers in Chaganhutun, key factors affecting their sustaina ble livelihoods are identified. Based on relevant literature and field research, this paper constructs a framework of factors influencing the sustainable livelihoods of farmers suitable for rural tourism in Chaganhutun, including their natural, physical, cultural and ecological capitals, which are seven primary indicators and 24 secondary indicators. the evaluation index system of the study on the impact factors of rural tourism on farmers' sustainable livelihoods covers ecological, cultural, natural, physical, human, social and financial aspects, so as to comprehensively assess the impact of rural tourism on farmers' sustainable livelihoods.

4. RESULTS.

The weight of the impact of ecological capital on the sustainable livelihoods of farming households is about 0.20, so the impact of ecological capital on the sustainable livelihoods of farming households in Chaganhutun is the most far-reach ing. Among them, ecological landscape attractive ness with the highest weight of 0.05 emphasizes its central position in the composition of ecological capital. Ecological resource utilization (with a weight of 0.04) and ecological management and protection reflection (with a weight of 0.05), which have relatively low weights, reflect that Chaganhutun lacks in balancing the relationship between economic development and ecological protection. the importance of ecological and economic benefits is recognized to a certain extent in the Chaganhutun area.

The weight of cultural capital in the sustainable livelihood of farmers is about 0.17. It highlights the fact that cultural capital has a significant impact on the sustainable livelihood of farmers. the weight of cultural inheritance and protection is 0.04. the weight of the degree of integration of cultural resources is 0.04. Chaganhutun carries a rich

fishing and hunting culture and folk culture, and the integration of the two can lead to more attractive cultural products and services and promote the prosperity and development of culture and tourism. the weight of the economic benefits of cultural capital is low at 0.03, and Chaganhutun lacks in the innovation and development of cultural industries. the social benefit of cultural capital has the highest weight of 0.05.

The weight of social capital in the sustainable livelihood of farm households is about 0.14. Among the three secondary indicators, the weight of family location conditions is 0.02. the weight of frequency of professional skill training is 0.05. the weight of family members' participation in social affairs is 0.07, and the highest weight reflects the important role of family members' participation in social affairs in social capital.

The weight of human capital in sustainable livelihoods of farm households is about 0.14. It ranks fourth among the seven capitals surveyed. Among the four secondary indicators, the experience of going out to work or starting a business had the smallest weight of 0.01. the number of family members involved in tourism had a higher weight of 0.05, highlighting the importance of abundant human resources in improving productivity. the number of friends and family members has a weight of 0.04. In modern society, the breadth of connections is not the only factor that determines the success of an individual. Language ability and cultural literacy weighted at 0.04.

The weight of physical capital in the sustainable livelihood of farmers is about 0.12. House size has the largest weight of 0.06, emphasizing the critical role of adequate and appropriate rooms and restaurants in attracting tourists. the type of house has a weight of 0.03, indicating that the structure and type of house also have an impact on the livelihood development of the farmers. the value of large items in the home had the lowest weight of 0.02.

The weight of natural capital in the sustainable livelihood of the farm household is about 0.12, which is a weak influence on the sustainable livelihood of the farm household. Cultivated land area has a weight of 0.03, with plot quality and agricultural production technology

being relied upon to a greater extent. the weight of homestead area is 0.04, and rational utilization and management are conducive to the improvement of the quality of life of residents and the protection of the ecological environment. the weight of plot quality is 0.04, and quality land resources utilize crop yield and quality, which contributes to sustainable agricultural development.

The weight of financial capital on sustainable livelihood of farmers is about 0.11. the extent of impact on sustainable livelihood of farmers is minimal. the weight of income from part-time work is 0.04. the contribution of income from part-time work is low compared to other sources of income. the weight of tourism income is 0.05, which is slightly higher than the income from part-time work. the weight of rural tourism input capital is only 0.03, which is an important guarantee for the development of rural tourism.

5. CONCLUSION AND DISCUSSION

The rise of rural tourism brings new development opportunities for farmers in Chaganhu Tun, but challenges also come along, for example, the development of tourism puts higher requirements on the ability of farmers in all aspects, and problems such as over-exploitation and environmental damage can also negatively affect the livelihood of farmers. Through questionnaire survey and data processing by entropy method, this paper finds that the weights of seven major livelihood capitals on the sustainability of farmers' livelihoods are, in descending order, 0.20 for ecological capital, 0.17 for cultural capital, 0.14 for social capital, 0.14 for human capital, 0.12 for physical capital, 0.12 for natural capital, and 0.11 for financial capital. With regard to these seven factors, sustainable livelihood improvement measures are proposed, of which ecological and cultural are the key ones. measures, of which ecology and culture are key, to optimize the use, management and protection of rural tourism ecological resources, promote the innovative development of rural native culture and improve economic efficiency. In addition, it should encourage active participation of the community, pay attention to the improvement of the skill level of farmers, optimize and improve the physical infrastructure, improve

the quality of natural resources, and improve the efficiency of the use of funds invested in rural tourism. In conclusion, in the context of rural tourism, the path to sustainable livelihoods for rural tourism farmers in Chaganhutun relies on effectively integrating and utilizing the unique ecological and cultural resources, flexibly adapting to changes in the actual situation, and promoting sustainable and healthy livelihoods amidst opportunities and challenges.

REFERENCES

[1] Cui, Xiaoming. Research on Synergistic Development of Tourism and Community in Qinba Mountain Area Based on Sustainable Livelihood Framework [D]. Northwest University, 2018.

[2] He Renwei, Liu Shaoquan, Chen Guoji, et al. Progress and tendency of research on sustainable livelihoods of Chinese farmers [J]. Progress in Geoscience, 2013, 32(04):657-670.

[3] SU Fang, XU Zhongmin, SHANG Haiyang. A review of research on sustainable livelihood analysis [J]. Progress in Earth Science, 2009, 24(01):61-69.

[4] WANG Rong, Dai Meiling, Ouyang Hong, et al. Measurement of farmers' livelihood capital in rural tourism land under the intervention of cultural capital: the case of Likeng village in Wuyuan [J]. Journal of Tourism, 2021, 36(07):56-66.

[5] Jing Sun. Research on the impact of rural tourism on the sustainable livelihood of farmers in Guilin Resources County [D]. Guilin University of Technology, 2019.

[6] Li Weina. Research on precise poverty alleviation of rural tourism based on sustainable livelihood of farm households [D]. Qingdao University, 2017.

[7] Wang Hongchen. Research on sustainable livelihood capital and strategy of rural

residents in Guilin Yangshuo heritage tourism site [D]. Guangxi University, 2020.

[8] Huang ZG, Lai J. Impacts of land acquisition for rural tourism on the well-being of landless farm households - a test based on the PSM model [J]. Resource Science, 2021, 43(01):171-184. EllisF. Liveli hoods and RuralPovertyReduction in Uganda [J]. World Development, 20 03, 31(6):997-1013.

[9] Ellis F. Livelihoods and Rural Poverty Reduction in Malawi [J]. World Development, 20 03, 31(9):14 95-1510.

[10] Chris H C, Ercan S. Sustainability indicators for managing community tourism [J]. Tourism Manage ment, 2005, 27(6):1274-1289.

[11] Sharpley R, Roberts L. Rural tourism-10 years on [J]. International Journal of Tourism Research, 2004, 6(3):119-124.

Achievements and Prospects of the Integration of Qi Culture and University Logistics Construction

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Abstract: This paper deeply explores the achievements obtained through the integration of Qi culture and university logistics construction. It also looks forward to the future development of integrating Qi culture into the university logistics construction. Through case studies of universities such as Zibo Vocational Institute, this paper elaborates on the results of integrating Qi culture in school catering, the concept of conservation, property services, and the campus environment. the integration of Qi culture not only enhances the comprehensive quality of students but also promotes the construction of campus culture. In the future, the integration of Qi culture and university logistics construction should be further strengthened to achieve the sustainable development of universities.

Keywords: Qi Culture; University logistics construction; Achievement Analysis

1. INTRODUCTION

Qi culture, an essential component of China's outstanding traditional culture, holds far-reaching importance. It originated in the State of Qi during the Spring and Autumn and Warring States Period, emphasizing values like harmony, justice, equality, and honesty, and features unique connotations and characteristics. Throughout its historical evolution, Qi culture has continuously evolved and innovated, having a significant impact on the development of Chinese culture. In contemporary society, Qi culture plays a crucial role in promoting the socialist culture with Chinese characteristics, enhancing social cultural literacy, facilitating the university logistics construction, as well as the all-round development and cultivation of social responsibility among students. Integrating Qi culture into the university logistics construction can enhance the quality of logistics services, create a favorable cultural atmosphere, and infuse cultural connotations and vitality into the development of colleges and universities. the fusion of Qi culture and the university logistics construction is of great significance for upgrading the quality of logistics services and cultivating the comprehensive quality of students.

Zibo Vocational Institute has actively responded to the national policy and is committed to integrating the practical work of spreading and educating people with Qi culture into the logistics construction. Through years of efforts, the institute has achieved fruitful results in the combination of Qi culture and logistics construction, providing a favorable environment and conditions for the growth and development of students.

2. ACHIEVEMENTS OF THE INTEGRATION OF QI CULTURE AND UNIVERSITY LOGISTICS CONSTRUCTION

2.1 Integration of Qi Culture into School Catering

Holding of the Food Culture Festival. Zibo Vocational Institute holds the Boshan Cuisine University Student Food Culture Festival through the school cafeteria platform, integrating Qi culture into the food tasting, allowing students to feel the profound connotations of Qi culture while tasting delicious food.

Embodiment of Lu Cuisine Culture. Zibo is one of the important origins of Lu cuisine. With its distinct regional geographical and historical and cultural characteristics, Lu cuisine has become an important representative of Chinese food culture. the dishes launched by the institute reflect the

characteristics of central Shandong cuisine, such as the emphasis on the use of soup stock and the fine production of dishes.

Cultural Connotations of Dishes. Dishes represented by Taigong's Double Carp, Taigong Meeting Ji Chang, and Taigong's Five-tone Green Vegetables respectively contain different historical allusions and cultural meanings, enabling students to understand the history and tradition of Qi culture while tasting the delicious food.

2.2 Integration of Qi Culture into the Concept of Conservation in Schools

Practice of the Concept of Green Development. Zibo Vocational Institute adheres to the concepts of conservation, environmental protection, and sustainability in Qi culture, promotes the work of ecological civilization education, and integrates the concept of green development into all aspects of the school's work.

Achievements in the Construction of Green Schools. Zibo Vocational Institute has achieved remarkable results in the construction of green schools and has been awarded honors such as the National Model Unit for Afforestation, the National Demonstration Unit for Energy-saving Public Institutions, and the Shandong Provincial Garden-style Unit. It has also been selected as an advanced school for the creation of a national civilized campus.

Implementation of Specific Measures. Zibo Vocational Institute has achieved the recycling of renewable energy by constructing a green campus, promoting the upgrading of energy-saving facilities, and using energy-saving products, creating a green and environmentally friendly learning and living environment for students.

2.3 Qi Culture Assisting School Property Services

Professional Management and Collaborative Ability. Zibo Vocational Institute employs professional property companies and greening teams, implements grid-based supervision and multi-faceted integrated supervision and inspection, and various departments collaborate to strengthen the management of the campus environment and improve the quality of property services.

Dynamic Management of Dormitories and Cultivation of a Good Atmosphere. Zibo Vocational Institute strengthens the management of dormitory environmental hygiene, cultivates students' good living habits and a civilized dormitory atmosphere through regular inspections and the holding of theme activities.

Satisfaction of Teachers and Students and Honors Received. the teachers and students of Zibo Vocational Institute are highly satisfied with the property services, and at the same time, have received many honors, indicating that the integration of Qi culture into property services has achieved good results.

2.4 Integration of Qi Culture into the Campus Environment

Construction of Hardware Facilities and Investment in Characteristic Facilities. Zibo Vocational Institute has increased investment in hardware facilities, constructed various classrooms, training rooms, and characteristic facilities, providing students with good learning and living conditions.

Naming of Buildings and Demonstration of Cultural Heritage. Zibo Vocational Institute names the buildings with the theme of "Fostering Virtue through Education", demonstrating the core values of education and the cultural characteristics of the institute. At the same time, the design of the building signs also reflects the elements of Qi culture.

Integration of Campus Signs and Qi Culture Elements. the road names of Zibo Vocational Institute adopt the 24 characters of "the core socialist values", and the design style of road signs integrates colors such as the college green and Harvard red, demonstrating the values advocated by Qi culture.

Architectural Design and Embodiment of the Spirit of Qi Culture. the campus architectural design of Zibo Vocational Institute reflects the integration of modernity and Qi culture elements, highlighting the humanistic inheritance and the ancient charm of Qi culture, and creating a campus environment with cultural connotations for students.

3. PROSPECTS FOR THE INTEGRATION OF QI CULTURE AND UNIVERSITY LOGISTICS CONSTRUCTION

With the development of society and the continuous updating of educational concepts, the integration of Qi culture and university

logistics construction has received increasing attention. This integration has profound significance and broad development prospects. the following will elaborate on the prospects of its integration from multiple aspects.

3.1 Further Exploration of the Connotations of Qi Culture

In the future, universities should further explore the connotations of Qi culture and integrate it more closely with logistics construction. For example, in-depth research on the management ideas and craftsmanship spirit in Qi culture can provide more cultural support for logistics management and services.

3.2 Strengthening Cultural Education and Promotion

Universities should strengthen the education and promotion of Qi culture to enable teachers and students to better understand and identify with it. This can be achieved through offering relevant courses, holding lectures, and organizing cultural activities to increase teachers' and students' awareness and interest in Qi culture.

3.3 Innovating Integration Methods

In the process of integrating Qi culture and university logistics construction, continuous innovation in integration methods is necessary. For example, using modern technological means such as the Internet of Things and big data to realize the intelligent and informatized logistics management while integrating the concepts of Qi culture.

3.4 Strengthening Cooperation and Exchange

Universities should strengthen cooperation and exchange with local governments, enterprises, and other universities to jointly promote the inheritance and development of Qi culture. This can be achieved through collaborative project development, resource sharing, and other means to achieve complementary advantages and improve the effect of the integration of Qi culture and logistics construction.

3.5 Cultivating Professional Talents

To better promote the integration of Qi culture and university logistics construction, it is necessary to cultivate a group of talents with professional knowledge and cultural literacy. Universities can strengthen the construction of related majors to cultivate compound talents who understand both logistics management and Qi culture.

4. CONCLUSION

The concepts emphasized in Qi culture, such as unity and cooperation, diligence and thrift, are in line with the educational goals of university logistics. In Zibo Vocational Institute, Qi culture is integrated into the diet by holding a food culture festival and launching special dishes, which enhances students' understanding of the culture. It is integrated into the concept of conservation, promoting the construction of a green campus and achieving a number of honors. It helps the property service to achieve professional management and dynamic management of dormitories, with high satisfaction among teachers and students. It is integrated into the campus environment, which is reflected in the construction of hardware facilities, building naming, road signs and architectural design. These achievements indicate that Qi culture plays an important role in the construction of university logistics, not only cultivating students' moral character and behavior habits, but also improving the campus management level and cultural atmosphere. In the future, we should further strengthen the research and practice of Qi culture to promote the modernization and humanization of university logistics construction and provide better support for the all-round development of students.

The integration of Qi culture and university logistics construction has achieved remarkable results, bringing a positive impact on the development of universities. By integrating Qi culture into school catering, the concept of conservation, property services, and the campus environment, the comprehensive quality of students has been improved, and the construction of campus culture has been promoted. In the future, the integration of Qi culture and university logistics construction should continue to be strengthened, the connotations of Qi culture should be further explored, integration methods should be innovated, cooperation and exchange should be strengthened, and professional talents should be cultivated to achieve the sustainable development of universities and provide a better environment and support for cultivating high-quality talents

with innovative spirit and practical ability. The integration of Qi culture and university logistics construction has broad development prospects and deserves further in-depth research and exploration. It is believed that with the joint efforts of all parties, Qi culture will play a greater role in university logistics construction and inject new vitality into the development of universities.

REFERENCES

[1] Wang Zimeng, Liu Yanchang, Ma Guoqing, et al. New Achievements and New Perspectives in the Study of Qi Culture [J]. Journal of Guanzi Studies, 2018, (03):120-128.

[2] Zhao Shanshan. A Brief Discussion on the Inheritance and Development of Qi Culture by Vocabulary in the Central Shandong Dialect [J]. Journal of Beijing Institute of Graphic Communication, 2020, 28(S2):99-102.

[3] Yao Xinhe. A Summary of the Formation, Status and Spirit of Qilu Culture [J]. Journal of Shandong Institute of Socialism, 2018, (03):65-71.

[4] Xie Weijun. the Practical Significance of Researching and Developing Qi Culture [J]. Theoretical Horizon, 2009, (01):55-57.

[5] Zhang Shengqun, Zhang Yong, Song Fei. Thoughts and Practices on Promoting the Cultural Construction of the Logistics Team [J]. University Logistics Research, 2024, (04):11-13+28.

[6] Ren Yanfeng. the Dissemination and Practice of Excellent Traditional Chinese Culture in the University Logistics System [J]. University Logistics Research, 2023, (12):56-59.

[7] Huang Yuetao. A Brief Discussion on Strengthening the Ideological and Political Education Work in University Logistics [J]. University Logistics Research, 2023, (05):39-41+45.

Research on the Digital Empowerment of Huangmei Opera Culture and Integration Pathways with Huanggang's Cultural Tourism Industry

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Abstract: This study aims to explore how digital means can empower Huangmei Opera culture and promote its deep integration with Huanggang's cultural tourism industry. Using literature review and field research methods, the study comprehensively evaluates the effectiveness of digital technologies in the preservation of Huangmei Opera culture and the development of Huanggang's tourism industry. By systematically reviewing relevant literature and analyzing existing digital application cases and the current state of Huanggang's tourism industry, the study proposes digital integration pathways that align with the characteristics of Huangmei Opera culture and local tourism resources. The study examines the role of new media platforms such as Douyin (TikTok) in promoting Huangmei Opera culture and evaluates the impact of augmented reality (AR) and virtual reality (VR) technologies on visitor experiences and cultural preservation through practical applications in Huanggang's tourism sites. The results demonstrate that digital tools can effectively enhance the dissemination and influence of Huangmei Opera while increasing the attractiveness and cultural content of Huanggang's tourist attractions, thereby achieving synergistic development between culture and tourism industries. Specific conclusions include: (1) Through multimedia platforms, Huangmei Opera culture reaches a wider youth audience. (2) The application of AR/VR technologies increases the interactivity and immersion of Huanggang's cultural tourism projects. (3) Digital empowerment not only modernizes the transmission of Huangmei Opera culture but also enhances the overall competitiveness of Huanggang's tourism industry. The study indicates that the integration pathway of digital empowerment and cultural tourism has feasibility and broad application prospects, providing new ideas and practical directions for combining traditional opera culture with local tourism industries.

Keywords: Digital Empowerment; Huangmei Opera Culture; Huanggang Cultural Tourism Industry; Augmented Reality; Cultural Preservation

1. INTRODUCTION
1.1 Research Background and Significance
Huangmei Opera, one of the five major traditional Chinese operas, originated in Huanggang, Hubei Province. It is rich in cultural connotations and unique artistic style. It is not only a symbol of local culture but also represents the diversity and profound heritage of Chinese traditional culture. With the modernization process, traditional operas face challenges such as an aging audience and limited forms of performance. Meanwhile, Huanggang's cultural and tourism industry is rapidly developing under the national policy of integrating culture and tourism. However, effectively achieving deep integration of culture and tourism remains a pressing issue. The spirit of the National People's Congress emphasizes the importance of cultural confidence and the construction of a culturally strong nation, advocating for the promotion of excellent Chinese traditional culture. In this context, Huangmei Opera, as an important

part of China's intangible cultural heritage, urgently needs to be protected and inherited through modern technological means. In recent years, the development of digital technology has provided new opportunities for the integration of culture and tourism. How to use digital means to empower Huangmei Opera culture and promote the coordinated development of Huanggang's cultural and tourism industry has become a hot topic in academia and politics.

The rapid development of digital technology offers new possibilities for the dissemination and protection of traditional culture. Through cutting-edge technologies such as Augmented Reality (AR), Virtual Reality (VR), Artificial Intelligence (AI), and Big Data analysis, more vivid and interactive cultural experiences can be created, attracting the participation and attention of the younger generation. This study aims to explore how digital means can empower Huangmei Opera culture, thereby promoting its deep integration with Huanggang's cultural and tourism industry, enhancing cultural confidence and influence, and promoting local economic development.

1.2 Research Objectives and Questions

The main objective of this study is to enhance the dissemination and influence of Huangmei Opera culture through digital means and to promote its effective integration with Huanggang's cultural and tourism industry. The research questions include: How to use AR and VR technologies to enhance the experiential effect of Huangmei Opera? How to expand the audience range of Huangmei Opera through new media platforms? How to improve the service level and visitor satisfaction of Huanggang's cultural and tourism industry through Big Data and AI? And what are the specific application effects of digital technology in the integration of cultural heritage and tourism industry?

1.3 Literature Review of Domestic and International Research

Domestically, research on Huangmei Opera culture mainly focuses on its inheritance and development paths. Hu Yumei's research emphasizes the important role of new media platforms in the dissemination of Huangmei Opera through ethnographic studies on the Douyin platform. Wang Yuan and Ji Zhiqing, studying the inheritance and development of

traditional operas from the perspective of intangible cultural heritage, propose that Huangmei Opera, as intangible cultural heritage, needs to be widely disseminated and influenced through modern technological means. Liu Changchang and Ding Shiwen explore the diverse dissemination paths of Huangmei Opera in the context of the all-media era, pointing out that the use of emerging media and technological means can effectively enhance the influence and popularity of Huangmei Opera. From a practical perspective, Zhu Wenzheng's creation notes on "Duckling Sister" demonstrate how modern Huangmei Opera integrates new artistic elements into script creation while maintaining the integrity of traditional art forms. Gu Yitong analyzes the micro-documentary "Unforgotten Symbols," exploring the ritual construction and innovative paths of digital means in the inheritance of intangible cultural heritage operas, indicating that digital means can achieve dynamic recording and multi-level interpretation of intangible cultural heritage.

Internationally, research on similar traditional cultures often focuses on the application of digital means in cultural protection and dissemination. For example, Japan extensively uses VR and AR technologies in the inheritance of traditional Kabuki, allowing audiences to experience traditional performances immersively. This not only greatly enhances the viewing experience of traditional dramas but also helps in better dissemination and promotion of traditional culture among the younger generation. In Europe and the United States, there are many studies and practices on the digital application of performing arts such as musicals and operas. Through high-quality video recording and streaming platforms, traditional performing arts can reach a broader audience, breaking the limitations of time and space. These attempts not only improve the dissemination efficiency of artistic works but also provide rich interactive experiences for artists and audiences.

Currently, how to integrate Huangmei Opera culture with Huanggang's cultural and tourism industry is an important research direction. Digital means such as VR, AR, and Big Data analysis can provide new forms of expression

and dissemination channels for Huangmei Opera culture. Through digital means, tourists can use AR technology to watch Huangmei Opera performances at various historical and cultural sites in Huanggang, enhancing the cultural experience. Big Data analysis can help the cultural and tourism departments better understand the needs and preferences of tourists, thereby providing more personalized cultural and tourism services. The all-media era brings new opportunities for the dissemination of Huangmei Opera. Liu Changchang and Ding Shiwen point out that by integrating traditional and new media resources, the comprehensive and multi-channel dissemination of Huangmei Opera culture can be achieved. Short video platforms like Douyin provide a new stage for the dissemination of Huangmei Opera, making its forms of display more diverse and more attractive to young audiences. Through live streaming on online platforms, audiences can not only watch Huangmei Opera performances but also interact with performers in real-time, increasing the sense of participation and interactivity in the art. Hu Yumei mentions in her research that through short video platforms like Douyin, the essence of Huangmei Opera performances can be digitally recorded and archived online for future reference and learning. This digital display not only aids in the protection of Huangmei Opera culture but also provides a new and convenient path for its dissemination. The dissemination methods in the all-media era bring more audiences and organically integrate traditional art with modern technology. Wu Qianru and Ye Xiaojun's research shows that personalized empowerment in vocational art public English practice teaching can achieve a good combination of vocational art education and cultural dissemination. This approach is also applicable to the promotion of Huangmei Opera culture. Through interdisciplinary cooperation, combining Huangmei Opera art with other disciplines such as language and technology can create more new forms and paths of dissemination, promoting the innovation and development of Huangmei Opera culture. The inheritance and development of Huangmei Opera culture not only rely on traditional opera performance

forms but also need to leverage modern technology and innovative methods to maintain its vitality and appeal among the younger generation. Dissemination through short video platforms like Douyin can significantly enhance the popularity and likability of Huangmei Opera among young people.

In summary, the current state of research shows that the inheritance and development of Huangmei Opera culture in the digital context face both challenges and opportunities. Digital means can achieve dynamic recording and multi-level interpretation of Huangmei Opera culture, providing new paths and methods for its inheritance and dissemination. Domestic scholars have explored various perspectives on the protection and dissemination paths of Huangmei Opera, accumulating rich experiences and theoretical results. Meanwhile, the digital applications in similar traditional cultures abroad provide valuable references for the digital development of Huangmei Opera culture. In conclusion, empowering Huangmei Opera culture with digital means and integrating it with Huanggang's cultural and tourism industry is a research field full of potential and prospects. Through systematic research and practice, the influence and dissemination of Huangmei Opera culture can be enhanced, promoting the high-quality development of Huanggang's cultural and tourism industry, and achieving a win-win situation for culture and economy.

1.4 Research Methods

This study adopts methods such as literature review, case analysis, and field research. By systematically reviewing relevant literature, analyzing existing digital application cases, and evaluating their application effects in cultural dissemination and the cultural and tourism industry, the study aims to propose digital integration paths that suit the characteristics of Huangmei Opera culture and local cultural and tourism resources. These paths will then be preliminarily verified and evaluated through field research on the current development status of Huanggang's cultural and tourism industry.

2. OVERVIEW OF DIGITAL TECHNOLOGIES

2.1 Augmented Reality (AR) Technology

Augmented Reality (AR) technology overlays virtual information onto real-world scenes, creating interactive user experiences. AR can bring a new way of experiencing Huangmei Opera performances. For example, when audiences use AR glasses to watch a performance, relevant historical backgrounds, character introductions, and lyric translations can appear in real-time, providing a richer viewing experience. This not only helps the audience understand and appreciate the performance but also attracts more young viewers.

For instance, in some tourist attractions in Huanggang, AR technology can allow tourists to see historical scenes and character performances related to Huangmei Opera when they use their mobile phones or AR glasses, adding interactivity and fun to the cultural experience. Currently, AR technology has been widely used in museums and cultural venues both domestically and internationally, with significant effects and high promotional value.

2.2 Virtual Reality (VR) Technology

Virtual Reality (VR) technology creates fully immersive virtual environments, allowing users to experience Huangmei Opera performances in a 360-degree view. The performance scenes and historical backgrounds of Huangmei Opera can be reconstructed in a virtual environment using VR technology, enabling those who cannot attend in person to feel as if they are part of the performance. Additionally, VR technology can be applied to the training and education of Huangmei Opera, allowing learners to practice in highly simulated environments, thereby improving learning outcomes.

In Huanggang's cultural and tourism industry, VR technology can also be used in experience design for tourist attractions. For example, before entering a scenic area, tourists can use VR devices to preview the main attractions and activities, increasing their anticipation and engagement. This application not only enhances the tourism experience but also provides new avenues for the dissemination of traditional culture.

2.3 Artificial Intelligence and Big Data Analysis

Artificial Intelligence (AI) and Big Data analysis have multiple application potentials in the integration of Huangmei Opera culture and Huanggang's cultural and tourism industry. AI technology can automatically annotate and intelligently push Huangmei Opera content through voice recognition, image recognition, and other means, enhancing the efficiency of digital preservation and dissemination of Huangmei Opera. Big Data analysis can help cultural and tourism departments formulate more precise marketing strategies and service plans by analyzing data on tourist behavior and preferences.

For example, by analyzing data from audiences watching Huangmei Opera performances, it is possible to understand the preferences and needs of different age groups and regions, allowing for corresponding adjustments in content creation and promotion. Big Data analysis can also be used to assess the popularity of different tourism projects, optimize resource allocation in scenic areas, and improve visitor satisfaction.

2.4 New Media Platform Dissemination Technology

The rapid development of new media platforms provides vast space and new opportunities for the dissemination of Huangmei Opera. Through short video platforms, live streaming platforms, and social media, the highlights and related content of Huangmei Opera can be quickly and widely disseminated to audiences of all ages. Especially for the younger generation, new media platforms are more familiar and favored, helping to expand the audience base of Huangmei Opera.

In Huanggang's cultural and tourism industry, new media platforms can be used not only for promoting Huangmei Opera but also for the promotion and interaction of tourist attractions. For example, by posting featured videos of Huanggang's scenic spots on platforms like Douyin and Kuaishou, more tourists can be attracted to visit. Additionally, through live streaming, tourists can stay updated on the latest activities and events in the scenic areas, enhancing their sense of participation and interaction.

3. HISTORY AND CURRENT STATUS OF HUANGMEI OPERA CULTURE
3.1 Historical Evolution of Huangmei Opera

Huangmei Opera originated in Huangmei, Hubei Province, with a long history. According to research, Huangmei Opera evolved from the "Flower Drum Opera" of the late Ming and early Qing dynasties. It was initially popular in the rural areas of Huangmei and gradually spread to Anhui Province, forming a unique opera style by the mid-Qing Dynasty. Early forms of Huangmei Opera mainly centered around folk tunes, depicting rural themes such as "The Heavenly Match" and "The Female Prince Consort," which remain popular with audiences today. As Huangmei Opera continued to develop and evolve, its artistic forms and themes became more diverse, spreading widely across the country and gradually becoming one of China's five major operas.

The evolution of Huangmei Opera not only reflects the continuous accumulation and inheritance of local culture but also demonstrates its artistic innovation and adaptability in different historical periods. The 1950s marked a golden era for Huangmei Opera, with the involvement of film art significantly boosting its popularity. Huangmei Opera films like "The Heavenly Match" and "The Female Prince Consort," starring Yan Fengying, became immensely popular, opening a new chapter in the modern dissemination of Huangmei Opera. However, with the modernization of society and the diversification of cultural forms, Huangmei Opera faces unprecedented challenges, such as an aging audience and difficulties in inheritance and development.

3.2 Artistic Characteristics of Huangmei Opera

Huangmei Opera stands out in Chinese traditional opera with its unique artistic characteristics, mainly reflected in the following aspects:

Beautiful Singing and Melodious Tunes: Huangmei Opera's singing is based on local folk tunes, characterized by beautiful, smooth melodies with a strong sense of rhythm and appeal. The lyrics are easy to understand, often using dialects, and rich in local flavor, making it popular among a wide audience. The use of "Xipi" and "Erhuang" tune systems in the singing provides Huangmei Opera with diverse expressive means and strong performance capabilities, making it advantageous in lyrical, narrative, and descriptive aspects.

Simple and Lively Performance: The performance of Huangmei Opera is relatively simple and natural, focusing on the genuine expression of characters' emotions, closely related to the audience's life experiences. Performers use delicate body movements and realistic facial expressions to vividly portray the inner world and emotional changes of the characters, resonating strongly with the audience.

Rich and Intriguing Plots: The plots of Huangmei Opera usually draw from folk legends and historical stories, offering rich and varied content with strong dramatic appeal. The structure of the plays is rigorous, with twists and turns in the storyline, creating numerous climactic moments that hold high entertainment value. Whether it is a lyrical short play or a large historical drama, Huangmei Opera captivates the audience with vivid stories and excellent performances.

3.3 Inheritance and Challenges of Huangmei Opera

As an important part of Chinese traditional culture, the inheritance and development of Huangmei Opera face severe challenges. The first challenge is the aging audience. With modernization, the younger generation's interest in traditional opera has waned, leading to an aging audience base and declining market demand. Secondly, there is a gap in performance talent. As outstanding performers age, there is a lack of successors, putting immense pressure on the inheritance of the art form. Additionally, the diversification of modern cultural and entertainment forms poses significant challenges to the dissemination and influence of Huangmei Opera.

However, the rapid development of digital technology provides new opportunities for the inheritance and protection of Huangmei Opera. Digital means can achieve high-quality recording and preservation of Huangmei Opera performances and scripts, ensuring their permanent retention. Technologies such as VR and AR can recreate classic performance scenes, enhancing the audience's sense of immersion and experience. New media platforms can quickly and widely disseminate the highlights and related content

of Huangmei Opera to audiences of all ages, expanding its influence and reach.

4. CURRENT STATUS AND CHARACTERISTICS OF HUANGGANG'S CULTURAL AND TOURISM INDUSTRY

4.1 Basic Overview of Huanggang's Cultural and Tourism Industry

Huanggang City is located in the eastern part of Hubei Province, in the middle and lower reaches of the Yangtze River Plain. It boasts rich historical, cultural, and natural resources. Huanggang is not only the birthplace of Huangmei Opera but also home to numerous famous historical sites and natural landscapes, such as the Dabie Mountains and the hometown of Dong Yong. These unique resources provide a solid foundation and vast space for the development of Huanggang's cultural and tourism industry.

In recent years, with the implementation of national policies integrating culture and tourism, Huanggang City has continuously increased its investment and development efforts in the cultural and tourism industry. The government at various levels has actively promoted the deep integration of culture and tourism through policy guidance, financial support, and project construction, enhancing the overall competitiveness of the cultural and tourism industry. Huanggang City has hosted a series of significant cultural and tourism events, such as the Huangmei Opera Art Festival and the Dabie Mountain Tourism Festival, greatly enhancing its visibility and influence.

The development of Huanggang's cultural and tourism industry has garnered widespread attention and active participation from all sectors of society. Major travel agencies and cultural tourism enterprises have entered the Huanggang market, offering a series of creative and distinctive tourism products and services, effectively promoting the prosperity and development of Huanggang's cultural and tourism industry.

4.2 Advantages and Shortcomings of Huanggang's Cultural and Tourism Resources

Huanggang City boasts abundant cultural and tourism resources, which are not only unique and rare but also possess high historical, cultural, and ecological value. Huangmei Opera, as an important cultural resource of Huanggang City, with its unique artistic charm and profound cultural heritage, is a crucial component of Huanggang's cultural and tourism industry. In addition, Huanggang City is home to many famous historical sites and natural landscapes, such as the Dabie Mountains, the ancient battlefield of Chibi, and the hometown of Dong Yong. These resources provide a solid foundation and vast space for the development of Huanggang's cultural and tourism industry.

However, the development of Huanggang's cultural and tourism industry also faces some problems and challenges. Firstly, the distribution of resources is uneven, with some scenic spots and projects being underdeveloped, lacking scale effects and brand influence. Secondly, the level of infrastructure and public services still needs improvement, as some scenic spots' supporting facilities and service quality do not meet tourists' needs. Additionally, the development model of the cultural and tourism industry is relatively single, and the deep integration of culture and tourism requires further exploration and enhancement.

4.3 Local Government Policies and Support Measures

To promote the high-quality development of Huanggang's cultural and tourism industry, the government at various levels in Huanggang City has adopted a series of policies and support measures. Through government guidance, multi-party collaboration, and social participation, they aim to foster innovation and integrated development in the cultural and tourism industry. From a policy perspective, Huanggang City has issued a series of support policies and planning documents, providing a solid policy foundation for the development of the cultural and tourism industry. For example, the Huanggang City government released the "Implementation Opinions on Accelerating the Integration of Culture and Tourism Industries," proposing several specific measures and target tasks, offering clear directions and paths for the industry's development.

In terms of project construction, the Huanggang City government has increased its

investment and support for key cultural and tourism projects, actively promoting the construction of major projects such as the Huangmei Opera Theme Park, the Dabie Mountain Red Tourism Base, and the Dong Yong Cultural Park. These projects not only enhance Huanggang City's tourism reception capacity and service level but also provide new platforms and carriers for cultural display and inheritance. Additionally, Huanggang City has actively promoted its cultural and tourism resources and brand by hosting a series of significant cultural and tourism events, such as the Huangmei Opera Art Festival, the Dabie Mountain Tourism Festival, and the Tea Culture Festival, thereby enhancing its visibility and influence.

In terms of management and services, the Huanggang City government focuses on improving the management and service levels of scenic spots. By establishing and improving the cultural and tourism management mechanism, standardizing market order, and enhancing service quality, they aim to create a favorable environment for the development of the cultural and tourism industry. Moreover, Huanggang City has strengthened its cooperation with major travel agencies and cultural tourism enterprises, launching a series of creative and distinctive tourism products and services, attracting a large number of tourists to visit Huanggang, effectively promoting the prosperity and development of Huanggang's cultural and tourism industry.

5. INHERITANCE OF HUANGMEI OPERA CULTURE EMPOWERED BY DIGITAL TECHNOLOGY

5.1 Application of Multimedia Platforms in the Dissemination of Huangmei Opera

Multimedia platforms have shown significant effectiveness in the dissemination of Huangmei Opera, especially with the widespread adoption of mobile internet, making multimedia platforms one of the main channels for traditional culture dissemination. By leveraging rich multimedia forms such as videos, live streams, and images, the splendid performances and classic plays of Huangmei Opera can be vividly presented to audiences. Using short video platforms like Douyin and Kuaishou, certain classic segments of Huangmei Opera can be edited and recreated, attracting a large number of users through fun and interactive content. This form of dissemination not only breaks the limitations of time and space, allowing Huangmei Opera to be more widely spread, but also enhances audience participation and interactivity.

Data shows that China has over 900 million mobile internet users, with 700 million short video users. Compared to traditional opera performance forms, the dissemination speed of short video platforms is faster, and the impact range is broader, making it highly suitable for the popularization and promotion of Huangmei Opera content. For example, the classic play "The Heavenly Match" of Huangmei Opera can be recreated on short video platforms, combining its romantic storyline with modern popular elements, attracting a large number of young audiences. This form not only increases public understanding and interest in Huangmei Opera but also injects new vitality into it.

Live streaming platforms also have widespread applications in the dissemination of Huangmei Opera. For example, Huangmei Opera performers can conduct online performances through live streaming platforms, with audiences interacting with the performers through comments and rewards. This form not only enhances the audience's sense of immersion and participation but also provides a new income stream for Huangmei Opera performers. While watching live performances, audiences can learn about the details and stories behind Huangmei Opera performances in real-time, deepening their understanding and appreciation of this cultural form.

Moreover, social media platforms are also important channels for the dissemination of Huangmei Opera. Through WeChat public accounts and Weibo, information related to Huangmei Opera, performance announcements, and actor interviews can be regularly published, maintaining continuous interaction with audiences. By establishing special communities for Huangmei Opera, enthusiasts can share their experiences and insights, creating a positive social atmosphere. The application of these multimedia platforms in the dissemination of Huangmei Opera not only improves the speed and effectiveness of dissemination but also provides new

possibilities for the inheritance and development of traditional opera culture.

5.2 Application of AR/VR Technology in Huangmei Opera Performance and Experience

Augmented Reality (AR) and Virtual Reality (VR) technologies are gradually transforming the ways in which traditional culture is disseminated and experienced. Using these cutting-edge technologies, the performance and experience of Huangmei Opera can be elevated to a new level. AR technology overlays virtual information onto real-world scenes, providing more intuitive and vivid experiences for the audience. For example, during live Huangmei Opera performances, audiences can use AR devices to see historically or scenically reconstructed backgrounds, making it easier for them to understand the plot and the inner world of the characters. Especially in large outdoor performances and tourist attractions, AR technology can provide real-time information about the historical and cultural background related to the performance, enhancing the transmission of cultural connotations.

VR technology creates fully immersive virtual environments, allowing audiences to experience Huangmei Opera performances in a 360-degree view. Using VR headsets, audiences can immerse themselves in the performance scenes, watching from multiple angles and distances as if they were actually there. The application of such technology not only expands the audience base of Huangmei Opera but also significantly enhances the viewing experience. For instance, the classic Huangmei Opera play "The Female Prince Consort" can be recreated using VR technology, allowing audiences to interact with characters in the virtual scene, further deepening their understanding of the plot and characters.

AR and VR technologies can be used not only in live performances of Huangmei Opera but also in cultural exhibitions and educational training. For example, VR technology can provide multi-dimensional displays of the history and cultural background of Huangmei Opera in museums and cultural centers, enhancing the interest and interactivity of exhibitions. In educational training, VR technology can simulate the stage environment of Huangmei Opera, helping performers rehearse and practice, thereby improving their performance levels. The application of these technologies not only enhances the dissemination and influence of Huangmei Opera but also provides new solutions for its inheritance and protection.

5.3 Application of Digital Archives and Cloud Storage Technology in the Protection of Huangmei Opera

Digital archives and cloud storage technology play a crucial role in the protection of Huangmei Opera culture. Traditional methods of cultural protection and inheritance, such as manual archiving and physical collections, are time-consuming, labor-intensive, and prone to information loss and damage. Digital archiving technology enables comprehensive digitization of Huangmei Opera scripts, performance recordings, and oral histories of artists, ensuring high-quality preservation and permanent retention. Utilizing cloud storage technology, these digital archives can be stored on secure and stable cloud platforms, making them easily accessible and manageable at any time.

Digital archives and cloud storage technology also facilitate the sharing and transmission of Huangmei Opera materials. By establishing a digital archive library for Huangmei Opera, researchers, performers, and enthusiasts can access and query relevant materials anytime, enabling efficient information exchange and resource sharing. The application of these technologies not only enhances the efficiency and accuracy of Huangmei Opera cultural protection but also provides abundant materials and references for subsequent research and creation.

In the realm of cultural heritage protection, cloud storage technology can be integrated with intelligent analysis tools to analyze and study performance data, audience feedback, and other relevant information of Huangmei Opera. This can help identify patterns and trends, providing scientific evidence for cultural inheritance and innovation. The high security and large capacity of cloud storage platforms effectively protect and manage the digital archives of Huangmei Opera, preventing data loss and leakage.

6. PATHWAYS FOR THE INTEGRATION

OF DIGITAL TECHNOLOGY IN HUANGGANG'S CULTURAL AND TOURISM INDUSTRY

6.1 Integration Model of Huangmei Opera Culture with Tourism Projects

The intervention of digital technology makes it possible to innovate the integration model of Huangmei Opera culture with Huanggang's cultural and tourism industry. By leveraging digital means, Huangmei Opera culture can be more flexibly and diversely integrated into tourism projects, forming a unique cultural tourism brand. For example, Huanggang City can develop a Huangmei Opera theme park, incorporating elements from classic Huangmei Opera plays and characters into the park's design and layout. Through rich interactive experiences and cultural activities, the park can attract tourists to participate and experience. Such a theme park can not only increase the enjoyment and engagement of tourists but also effectively enhance the cultural tourism image and visibility of Huanggang City.

Additionally, Huanggang City can create a Huangmei Opera cultural district, embedding elements of Huangmei Opera's history, culture, and art into the district's architectural style, shop layouts, and public facilities, creating a strong cultural atmosphere. By hosting Huangmei Opera performances, cultural lectures, and art exhibitions, the district can attract more tourists and residents to visit and experience, promoting deep integration and interactive development of cultural tourism.

These integration models not only enrich the cultural content and appeal of tourism projects but also provide new platforms and channels for the dissemination and promotion of Huangmei Opera culture, forming a virtuous cycle of mutual promotion and support between culture and tourism.

6.2 Application of Digital Means in Interactive Experiences at Huanggang Scenic Spots

Digital means have broad application prospects in interactive experiences at Huanggang scenic spots, especially in enhancing the appeal of scenic spots and the participation of tourists. Digital technology plays an important role. By leveraging Virtual Reality (VR) and Augmented Reality (AR) technologies, new interactive experiences can be created within the scenic spots. For example, AR interaction points can be set up within the scenic spots, allowing tourists to see virtual historical scenes and characters through their phones or AR glasses and interact with virtual characters, increasing the fun and educational value of the tour.

Interactive experience designs can be developed based on the characteristics of the scenic spots and the needs of tourists, creating a series of creative and interesting interactive projects. For example, in the Dabie Mountain scenic area in Huanggang City, AR interactive experiences themed around red tourism can be designed, allowing tourists to relive red history and revolutionary spirit through AR devices. In the hometown of Dong Yong, VR technology can recreate the romantic story of Dong Yong and the Seventh Fairy, making tourists feel as if they are in the story, enhancing the sense of immersion and intimacy in the cultural experience.

In the implementation of interactive experiences, intelligent guide systems can also be integrated to provide personalized guide services and interactive experience recommendations. For example, through intelligent guide applications, tourists can obtain detailed information and guide routes of the scenic spots in real-time, learning about the history, culture, and natural landscapes of the spots. Additionally, the system can recommend relevant interactive experience projects and activities based on tourists' interests and preferences, enhancing their tour experience and satisfaction.

6.3 Application of Big Data Analysis in the Development of Huanggang's Cultural and Tourism Industry

Big data analysis technology holds significant value in the development of Huanggang's cultural and tourism industry, especially in market marketing, tourist behavior analysis, and service optimization. By analyzing a large amount of tourist data, it is possible to understand tourists' behavior, preferences, and needs, providing scientific evidence for the development of the cultural and tourism industry. For example, by analyzing tourist flow data at Huanggang scenic spots, it is possible to understand the distribution of tourists at different times and spots, supporting resource allocation and

management decision-making in the scenic spots.

In market marketing, big data analysis can help cultural and tourism enterprises formulate precise marketing strategies. For example, by analyzing tourists' interests and consumption behaviors, it is possible to understand the needs and expectations of different tourist groups, providing a basis for formulating targeted marketing plans. By monitoring and analyzing public opinion on social media, it is possible to understand tourists' evaluations and feedback on the scenic spots, timely adjusting and optimizing service quality and content.

In service optimization, big data analysis can help scenic spots improve tourist satisfaction and experience. For example, by analyzing tourists' behavior trajectories and dwell times within the scenic spots, it is possible to understand their touring habits and hotspot areas, optimizing guide routes and facility layouts in the scenic spots, improving touring efficiency and experience. By analyzing tourist complaints and feedback data, it is possible to understand their needs and issues, timely adjusting and improving service content and methods, enhancing tourist satisfaction and loyalty.

6.4 Digital Marketing and Brand Building in Cultural and Tourism Industry

Digital marketing plays an important role in brand building in Huanggang's cultural and tourism industry. Through digital means, it is possible to enhance the visibility and influence of cultural and tourism brands, increasing tourists' recognition and loyalty. For example, through social media platforms, relevant information and activity updates about Huanggang's cultural and tourism industry can be regularly published, maintaining continuous interaction with tourists, increasing their attention and understanding of the brand. Collaborating with well-known influencers and opinion leaders can expand the brand's reach and influence, attracting more tourists to visit Huanggang.

In the process of digital marketing, big data analysis and precise push technology can be combined to achieve personalized marketing promotion. For example, by analyzing tourists' interests and consumption behaviors, personalized tourism product and service recommendations can be pushed to different tourist groups, enhancing marketing effectiveness and tourist satisfaction. Through precise market segmentation and positioning, targeted marketing plans and activities can be formulated, improving the return on investment and efficiency of marketing efforts. Additionally, in brand building, digital means can be used to innovate brand communication and display methods. For example, through VR and AR technologies, the beautiful scenery and culture of Huanggang's scenic spots can be recreated in virtual spaces, allowing tourists to experience the charm of Huanggang tourism from home, increasing their willingness and anticipation to visit. Through short video and live streaming platforms, real scenes and activities of Huanggang's cultural and tourism industry can be showcased, enhancing the brand's intimacy and appeal.

These digital marketing and brand-building methods provide new development paths and ideas for Huanggang's cultural and tourism industry, not only enhancing the visibility and influence of cultural and tourism brands but also offering tourists richer and more diverse tourism experience options, promoting the high-quality development of Huanggang's cultural and tourism industry.

7. CONCLUSION

This study reveals the significant role of digital technology in cultural heritage and tourism development. Through analysis and specific applications, we can see that the comprehensive application of multimedia platforms, AR/VR technology, digital archives and cloud storage technology, big data analysis, and digital marketing effectively enhances the dissemination and influence of Huangmei Opera and provides new ideas and pathways for the innovative development of Huanggang's cultural and tourism industry. These digital means not only promote the inheritance and protection of Huangmei Opera culture but also provide new momentum and opportunities for local economic development. Through systematic research on the integration pathways of Huangmei Opera culture and Huanggang's cultural and tourism industry, this paper contributes mainly in the

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following aspects:

It provides systematic theoretical and practical guidance for the digital inheritance of Huangmei Opera culture. By analyzing in detail the specific applications of multimedia platforms, AR/VR technology, digital archives, and cloud storage technology in the inheritance of Huangmei Opera culture, it offers new methods and pathways for the digital protection and dissemination of traditional opera culture.

It offers new ideas and practical models for the digital integration of Huanggang's cultural and tourism industry. Through the analysis of specific cases and the summary of experiences, it reveals the broad applications and immense potential of digital means in the cultural and tourism industry, providing valuable references and insights for the digital development of other regions and traditional cultures.

Through case analysis and experience reflection, it provides valuable insights and suggestions for the digital design, operation management, and market promotion of cultural and tourism projects, helping to improve the management level and tourist experience of cultural and tourism projects, promoting the high-quality development of the cultural and tourism industry.

REFERENCES

[1] Hu Yumei. Network ethnography research on the Dissemination of intangible cultural heritage of Huangmei Opera in Douyin [D]. Heilongjiang University,2023.

[2] Wang Yuan, Ji Zhiqing. Research on inheritance and development of traditional opera under intangible cultural heritage -- Based on discussion of Huangmei Opera [J]. Sichuan Drama, 2023(8).

[3] Liu Changchang, Ding Shiwen. Analysis on multiple communication paths of Huangmei Opera in the all-media era [J]. Journal of Yuzhang Normal University, 2023, 38(4):115-123. (in Chinese)

[4] Zhu Wenzheng. Modern Huangmei Opera "Duck 'er's Wife" creation notes [J]. Huangmei Opera Art, 2022(3):2.

[5] Gu Yi-tong. The ritual construction and innovation path of intangible cultural heritage drama micro-documentary: A case study of NetEase Yun's "Never Forgotten Symbol" [J]. Oriental Art, 2024(1).

[6] Wu Qianru, Ye Xiaojun. Research on the practice Teaching of Art Public English in Higher Vocational Colleges with personalized empowerment [J]. Journal of Chizhou University, 2020, 34(6):4.

Implementation Path Analysis of Python Data Analysis Tool in Big Data and Accounting Major Teaching

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Abstract: In the era of big data, the accounting profession has gradually transformed from traditional accounting processing to data-driven financial decision-making. Python, as a simple and powerful programming language, has become one of the core tools for big data analysis. This paper discusses the implementation path of Python data analysis tool in big data and accounting major teaching, analyzes its application in course design, teaching mode, practical teaching and other aspects, aiming to provide useful reference for the curriculum reform of big data and accounting major in higher vocational colleges.
Key words: Python data analysis; Big data and accounting major; Teaching reform;

1. OVERVIEW
1.1 Research background
With the rapid development of big data technology, accounting profession is gradually moving towards data and intelligence. Traditional accounting teaching focuses more on the preparation of financial statements, auditing and taxation, etc. In the face of a large amount of financial data in modern enterprises, how to make decision support through big data analysis has become a new key ability requirement. In this context, programming languages, especially Python, have gradually become a widely used tool in big data and accounting majors due to its simplicity, efficiency, ease of mastering and rich library functions. In higher vocational colleges, the introduction of Python data analysis tools can not only improve students' data processing and analysis ability, but also help them better adapt to the modern accounting industry's demand for composite talents. Therefore, the study on the implementation path of Python in the

teaching of big data and accounting is of great significance to the reform of the current curriculum system and the optimization of talent training mode.
1.2 Research significance
This paper aims to explore the application of Python data analysis tool in big data and accounting major, and explore how to better integrate Python data analysis technology into accounting major teaching by analyzing its implementation path in course setting, teaching mode and practical operation. This paper provides theoretical guidance for the curriculum reform of higher vocational colleges, and puts forward suggestions for future teaching innovation.

2. THE ROLE OF PYTHON DATA ANALYSIS TOOL IN BIG DATA AND ACCOUNTING MAJOR
In the field of accounting, the traditional financial data processing and analysis methods usually rely on tools such as Excel, but in the face of the growing demand for big data, these tools have gradually exposed the problem of low processing efficiency and poor scalability. Python can easily deal with structured and unstructured data, especially in the process of cleaning, sorting and analysis of massive financial data shows its powerful data processing ability. By using Pandas, NumPy and other libraries, students can quickly read, process and analyze data, easily complete data screening, pivot table calculation and other operations, so as to improve work efficiency. This advantage enables students to mine valuable information from complex financial data to provide enterprises with data-based financial analysis and management decisions. Python's ability to automate financial statement generation and data analysis is also

a highlight of its application to accounting teaching. By writing automated scripts in Python, students can realize the automatic generation of financial statements, such as income statements, balance sheets and cash flow statements. The automation function of Python not only saves a lot of manual operation time, but also reduces the errors caused by human operation to ensure the accuracy of data. In addition, by generating charts and data reports through data visualization libraries (such as Matplotlib, Seaborn), students are able to visually present financial data, supporting clearer analysis of financial situation. This enables students to respond quickly to business needs in practical work, providing immediate financial analysis and decision support.

In the era of rapid development of big data and artificial intelligence, accounting graduates with Python programming skills have stronger career competitiveness. When hiring accounting talents, more and more enterprises not only require candidates to have solid accounting knowledge, but also expect them to master data analysis skills, especially programming languages such as Python. Data analysis and automation through Python can greatly improve the efficiency and accuracy of financial work, and this ability has become an important plus for financial managers. In the process of learning Python, students not only master programming skills, but also improve the ability of data analysis, which enables them to cope with the complex financial management needs of modern enterprises, and become "compound" financial talents with data sensitivity.

3. PYTHON DATA ANALYSIS TOOLS IN THE TEACHING OF THE PROBLEMS

3.1 Insufficient teaching resources and experience

At present, many colleges and universities have introduced Python as a data analysis tool in accounting teaching, aiming to improve students' programming ability and data processing ability. However, some schools fail to provide comprehensive teaching support for students due to lack of sufficient teaching resources and experience. The lagging development of syllabuses, textbooks and teaching cases has resulted in a disconnect between course content and industry application needs. The application of Python data analysis tools involves a lot of practice and case analysis, but the school has not invested enough in case base construction and teaching resource integration, and has failed to form a systematic teaching system. This makes it difficult for students to fully grasp the practical application scenarios and skills of Python in the learning process.

3.2 Teachers lack programming ability

The introduction of Python programming has put forward higher requirements for teachers' professional competence. Most teachers of traditional accounting majors have rich experience in accounting theory and practice, but may not have enough experience in programming and data analysis. Some teachers only stay at a superficial level of programming grammar teaching, unable to give in-depth guidance to students on how to effectively use Python tools in actual accounting analysis. This not only affects the teaching effect, but also makes it difficult for students to combine programming knowledge with accounting business.

3.3 Students' programming foundation is weak

As a programming language, Python is a new challenge for most accounting students. In particular, some students lack a programming foundation when they enter the school, and may feel confused and stressed when they come into contact with Python. Although the Python programming language is easy to learn, it still requires strong logical thinking ability and practical operation when it comes to data processing, statistical analysis and visualization.

3.4 Deficiency of practical environment

Programming teaching cannot be separated from practice environment, and students need to consolidate theoretical knowledge and improve application ability in practical operation. However, some schools are unable to provide students with enough opportunities for programming practice due to backward hardware equipment or lack of software platforms. This may limit students' hands-on ability and reduce the effectiveness of learning.

4. THE IMPLEMENTATION PATH OF PYTHON DATA ANALYSIS TOOLS IN

TEACHING

4.1 Course design and content setting

In order to effectively introduce Python data analysis tools into the curriculum system of big data and accounting majors, course design should follow the principle of step by step, and pay equal attention to theory and practice. The content of the course should start from the basic Python grammar teaching, and gradually deepen to the actual cases of data analysis and financial application. The first part of the course should cover basic Python programming, such as variables, data types, loops, functions, file manipulation, etc. Through this basic knowledge, students will be able to master Python's core programming skills and lay the foundation for subsequent financial data analysis. After mastering the basic syntax of Python, the second part of the course should lead students to learn Pandas, NumPy and other libraries for data processing. Students will learn how to read, clean, and process financial data using Python. Subsequently, data visualization tools such as Matplotlib and Seaborn can be introduced to help students better understand the visual presentation of financial data. The final part of the course should be combined with specific financial cases for comprehensive analysis and practice. For example, analyzing historical financial data of a company through Python, generating financial statements, making financial forecasts and analyzing risks. In addition, students can apply what they have learned to financial decisions in a simulated real corporate environment through project practice.

4.2 Reform the teaching model

In order to better integrate Python data analysis tools into teaching, the teaching model needs to be innovated. This can be done through project-based teaching, flipped classrooms, and online teaching and self-learning platforms. In the project-oriented teaching model, teachers no longer rely solely on theoretical explanations, but drive students' learning through project tasks. For example, students can participate in a weeks-long project to analyze financial data and finally submit a financial report based on big data analysis. This model can greatly improve students' learning engagement and hands-on skills. Flipped classroom is another teaching model that works well for Python courses. Students learn the basics of Python by themselves through an online learning platform before class, while in class they discuss problems and work on projects. Teachers act as mentors in class, helping students solve practical problems in programming and giving feedback on projects. Considering that programming learning requires a lot of practice, online teaching platforms such as Jupyter Notebook, Kaggle and others can provide students with a wealth of self-study resources and an environment for online programming practice. Through these platforms, students can carry out programming exercises and complete data analysis tasks anytime and anywhere.

4.3 Practical teaching and evaluation mechanism

The teaching effectiveness of Python data analysis tools depends on sufficient practice; therefore, the design of practical teaching is crucial. Schools should provide students with good practical training environment, such as data laboratory, virtual experiment platform, etc. In addition, enterprise cooperation projects are also an important way of practice. Students can carry out tasks such as financial analysis and tax audit through real data provided by enterprises to improve their practical combat ability. In terms of evaluation mechanism, in addition to the traditional written test and programming test, the performance of practical projects should be regarded as an important part of students' grades. By comprehensively examining students' programming ability, data analysis ability and teamwork ability in practical projects, we can evaluate their learning effect more comprehensively.

5. CONCLUSION

The application of Python data analysis tool in the teaching of big data and accounting provides students with effective technical means and improves their ability of data analysis and financial management. Through reasonable course design and innovative teaching mode, Python can be well integrated into the teaching of accounting majors, helping students better adapt to the needs of modern enterprises for financial data analysis skills. Although there are some challenges in

the implementation process, these problems can be effectively solved by strengthening teacher training, improving course design and increasing practical resources. In the future, with the further development of big data technology, Python will be more widely used in the accounting profession, bringing new opportunities for vocational education.

REFERENCES

[1] Du Shilei. (2024). Status and development of data science analysis tools under the background of big data. Communications World (03),142-144.

[2] Chen Xiyue. (2024). Student-centered innovation of Online and Offline Diversified courses: A case study of Big Data Analysis Tools and Technology courses. Chinese Journal of Multimedia and Network Teaching (last ten-day issue) (03),39-42.

[3] Xu Xiaopeng, Yang Jing, Wang Shenggui & Nie Xiao. (2023). Big Data and Intelligent Accounting Analysis. Chongqing University Press.

[4] Zhang Lijun, Li Qiong, Hou Xiaokun & Xiamen Network-in-a-Network Software Co., LTD. (2022). Big Data Financial Analysis. China Posts and Telecommunications Press.

[5] Wang Juan, Huadong & Luo Jianping. (2019). Fundamentals of Python programming and data analysis. Nanjing University Press.