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## Scientific and Social Research

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# On the Seismic Response Mechanism and Safety Assessment Method of the Plank Road at Beishi Grottoes in Qingyang

Shenghui Wu\*

Lanzhou Petrochemical Vocational and Technical University, Lanzhou 730600, Gansu, China

*\*Author to whom correspondence should be addressed.*

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**Abstract:** The plank road at Beishi Grottoes in Qingyang is an important part of intangible cultural heritage. Studying its response mechanism and safety assessment under earthquake action is of great significance. Through field investigations and seismic simulation analysis of the plank road at Beishi Grottoes in Qingyang, this paper studies the structural response, damage evolution, and safety performance of the plank road under earthquake action. The results show that the structural form and material properties of the plank road have a significant impact on its seismic response. Reasonable seismic design and reinforcement measures can effectively improve the seismic capacity and safety of the plank road. This study provides a theoretical basis and technical support for the seismic safety assessment of grotto plank roads in the context of intangible cultural heritage protection.

**Keywords:** Intangible cultural heritage protection; Beishi Grottoes in Qingyang; Plank road; Seismic response; Safety assessment

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## 1. Introduction

The plank road at Beishi Grottoes in Qingyang is one of the outstanding representatives of ancient Chinese grotto art, with important historical, artistic, and scientific values. However, due to its location in an earthquake-prone area, the safety of the plank road under earthquake action has always been the focus of attention. Therefore, conducting research on the seismic response mechanism and safety assessment of the plank road at Beishi Grottoes in Qingyang is of great practical significance for protecting this intangible cultural heritage.

## 2. Overview of the plank road at Beishi Grottoes in Qingyang

Beishi Grottoes in Qingyang are located at the foot of Fuzhong Mountain, 25 kilometers southwest of Xifeng



District, Qingyang City, Gansu Province. It is an important historical site on the Silk Road where Buddhism spread eastward to the Central Plains. The plank road is an important part of Beishi Grottoes, connecting various caves in the grotto complex and providing a passage for tourists to visit and pay homage. The structural forms of the plank road mainly include stone-built plank roads and wooden plank roads, with stone-built plank roads accounting for a relatively large proportion.

### 3. Establishment of the earthquake model

A three-dimensional finite-element model of the plank road at Beishi Grottoes in Qingyang is established using finite-element software<sup>[1-4]</sup>. The model takes into account factors such as the structural form, material properties, connection methods of the plank road, and earthquake ground motion input. The following are the specific steps for establishing the finite-element model of the plank road at Beishi Grottoes in Qingyang<sup>[5]</sup>.

#### 3.1. Determination of model geometric parameters

Conduct a detailed field measurement of the plank road at Beishi Grottoes in Qingyang to obtain the dimensions of various parts of the plank road, including its length, width, height, slope, step height, step width, and other geometric parameters.

Consider the structural details of the plank road, such as the size, shape, and arrangement of stones in the stone-built part, and the specifications and connection methods of wood in the wooden plank road. These details are represented with appropriate geometric models.

#### 3.2. Definition of material properties

For the stone-built part, determine its elastic modulus, Poisson's ratio, density, etc., based on the mechanical property parameters of common stones. Generally, the elastic modulus of common stones is about 30–60 GPa, Poisson's ratio is about 0.15–0.30, and the density is about 2500–3000 kg/m<sup>3</sup>. For the wooden plank road part, determine its corresponding mechanical property parameters according to the type of wood (such as pine, fir, etc.). The elastic modulus is usually around 10–13 GPa, Poisson's ratio is about 0.3–0.4, and the density is about 400–800 kg/m<sup>3</sup>.

#### 3.3. Mesh generation

According to the geometric shape and size of the plank road, select an appropriate mesh generation method, such as triangular meshes or quadrilateral meshes. For complex structural details and corners, use a smaller mesh size to ensure the accuracy of the model. Generally, a mesh side length between 10–50 cm is more appropriate.

#### 3.4. Definition of nodes and elements

Define nodes on the generated mesh. Nodes are the basic components of the finite-element model, used to describe the geometric position and degrees of freedom of the structure. According to the actual situation of the plank road, determine the number and distribution positions of the nodes. Usually, more nodes are set at key points of the plank road (such as corners, connection points, etc.).

Select an appropriate element type to simulate the structure of the plank road<sup>[6-7]</sup>. For the stone-built part, solid elements (such as tetrahedral elements, hexahedral elements, etc.) can be used, and for the wooden plank road part, beam elements or rod elements can be used. The selection of elements should be determined according

to the stress characteristics of the structure and the requirements of calculation accuracy.

Connect the nodes with the corresponding elements to form a complete finite-element model. Each element is interconnected with adjacent elements through its nodes, enabling the simulation of the overall mechanical behavior of the plank road.

### **3.5. Setting of boundary conditions**

Set the boundary conditions of the model according to the actual support conditions of the plank road in the grottoes. If the bottom of the plank road is fixed to the ground, apply fixed constraints at the bottom nodes to limit their displacements in all directions. If the plank road has a certain support span, set the corresponding boundary conditions according to the support method (such as simply supported, fixed-supported, etc.). For the part connected to the grotto wall, also set boundary conditions according to the actual connection situation, considering the constraint effect of the grotto wall on the plank road.

### **3.6. Definition of loading modes**

For earthquake ground motion input, use actual earthquake records or artificially synthesized earthquake ground motions as the loading mode. Simulate the earthquake action by applying the corresponding earthquake acceleration time-history at the bottom nodes of the model. Select an appropriate earthquake ground motion record according to factors such as the earthquake intensity and frequency spectrum characteristics.

In addition to the earthquake action, other loading conditions may also need to be considered, such as the human load on the plank road, wind load, etc. Apply the corresponding loads at the appropriate positions according to the actual situation <sup>[8]</sup>.

### **3.7. Model verification and modification**

After establishing the finite-element model, conduct model verification. Compare it with the experimental results or field observation data of the actual plank road structure under similar conditions to check the accuracy and reliability of the model. If there are deviations between the model and the actual situation, modify the model, such as adjusting the material properties, mesh generation, boundary conditions, etc., until the model can better reflect the actual mechanical behavior of the plank road <sup>[9]</sup>.

Through the above steps, a relatively accurate finite-element model of the plank road at Beishi Grottoes in Qingyang can be established for subsequent research on the seismic response mechanism and safety assessment analysis.

## **4. Structural response analysis**

Through the analysis of the finite-element model, structural response parameters such as displacement, stress, and strain of the plank road under earthquake action are obtained. The structural response analysis mainly includes the following aspects.

### **4.1. Displacement analysis**

Calculate the displacement of each node of the plank road under various working conditions, such as earthquake action, through the finite-element model. Include the displacement values in the horizontal direction, vertical direction, and various oblique directions, to clearly understand the deformation degree of the plank road in

different directions. For example, identify the parts with large displacements and those with relatively small displacements, and use this to evaluate the overall deformation characteristics and possible deformation trends of the plank road under external forces such as earthquakes, providing basic data for judging its structural safety.

## **4.2. Stress analysis**

Calculate the stress distribution of various parts of the plank road under different working conditions. Determine the magnitude and distribution law of the internal stress generated in the stone-built part and the wooden plank road part when they are stressed, such as the distribution area and numerical values of tensile stress and compressive stress. Stress analysis can reveal the internal stress state of the plank road structure and help to find the parts where stress concentration may occur. These parts are often the key positions prone to damage. By focusing on and evaluating the stress of these parts, a basis can be provided for taking targeted reinforcement measures<sup>[10]</sup>.

## **4.3. Strain analysis**

Obtain the strain situation of the plank road under various conditions. Clarify the deformation degree of the material during the stress process of the plank road, including the strain changes along the length, width, and thickness directions. Strain analysis can further reflect the deformation characteristics of the material. Combined with displacement and stress analysis, a more comprehensive understanding of the mechanical behavior of the plank road structure under the influence of different factors can be achieved, which is helpful for in-depth research on its failure mechanism and seismic performance.

The results show that the displacement and stress responses of the plank road are mainly concentrated at the nodes and connections of the plank road, while the strain response is mainly concentrated at the bottom and sides of the plank road<sup>[11–12]</sup>.

# **5. Safety assessment research**

## **5.1. Damage assessment indexes**

Select structural response parameters such as displacement, stress, and strain as damage assessment indexes, and use the analytic hierarchy process and fuzzy comprehensive evaluation method to evaluate the damage degree of the plank road.

## **5.2. Safety level classification**

According to the calculation results of the damage assessment indexes, the safety level of the plank road is divided into four levels: safe, basically safe, with safety concerns, and dangerous.

## **5.3. Safety assessment results**

Through the safety assessment, the distribution of the safety levels of the plank road at Beishi Grottoes in Qingyang under different earthquake ground motion inputs is obtained. The results show that the safety level of the plank road is mainly affected by factors such as the intensity of the earthquake ground motion input and the structural form and material properties of the plank road.

## **6. Seismic design and reinforcement measures**

### **6.1. Seismic design principles**

Based on the structural characteristics and seismic response mechanism of the plank road at Beishi Grottoes in Qingyang, the basic principles of seismic design are proposed, including strengthening node connections, improving structural integrity, using seismic-resistant materials, etc.

#### **6.1.1. Strengthening node connections**

**Strong column-weak beam:** In the design of the plank road at Beishi Grottoes in Qingyang, by reasonably adjusting the cross-sectional dimensions and reinforcement of columns and beams, the columns can bear greater loads during earthquakes, while the beams undergo plastic deformation first, acting as a “fuse.”

**Strong shear-weak bend:** Through reasonable reinforcement and other measures, improve the shear-resistance of components so that they undergo bending deformation first under earthquake action, consuming earthquake energy and avoiding shear failure. For example, at the joints of the columns and beams of the plank road, strengthen the configuration of stirrups to improve their shear-resistance.

**Strong node-weak component:** Pay special attention to the structure and reinforcement of nodes in the design to ensure that the nodes have sufficient bearing capacity and ductility. For example, for the connection nodes between the wooden plank road and the stone-built part of the plank road, use reliable connection methods and strengthened structural measures to improve the seismic performance of the nodes.

#### **6.1.2. Integrity principle**

Ensuring the integrity of the structure is one of the important goals of seismic design. The plank road at Beishi Grottoes in Qingyang should be considered as a whole in seismic design to avoid local damage leading to the collapse of the overall structure. This requires good connections and collaborative working capabilities among various parts of the design. For example, by setting appropriate ring beams and construction columns, connect the various parts of the plank road into a whole to improve the integrity and seismic capacity of the structure<sup>[13]</sup>.

#### **6.1.3. Energy dissipation principle**

Under earthquake action, the structure will absorb a large amount of energy. To prevent the structure from being damaged due to excessive energy, energy-dissipation measures need to be considered in the design. Energy-dissipating components such as dampers and buckling-restrained braces can be set. During an earthquake, these components enter the plastic deformation or energy-dissipation state first, absorbing and dissipating earthquake energy, thereby protecting the safety of the main structure. For example, set dampers at some key parts of the plank road, and the deformation and friction of the dampers can be used to consume earthquake energy.

#### **6.1.4. Local adaptation principle**

The seismic and geological conditions vary in different regions, and seismic design should be carried out according to the actual local conditions. For the area where the Beishi Grottoes in Qingyang are located, fully consider factors such as the local earthquake intensity, geological structure, topography, and geomorphology, and develop a seismic design plan suitable for this area. For example, if the local earthquake intensity is high and the geological conditions are complex, more powerful seismic measures may be required, such as increasing the seismic grade of the structure and using higher-quality building materials.

## 6.2. Reinforcement measures

According to the damage situation of the plank road and the results of the safety assessment, corresponding reinforcement measures are proposed, including adding support structures, strengthening node connections, replacing damaged components, etc. The following are some reinforcement measures for the plank road at Beishi Grottoes in Qingyang.

### 6.2.1. Adding support structures

Adding steel supports: Install steel support components at key vulnerable parts of the plank road, such as steep sections or areas crossing cracks <sup>[14]</sup>.

Adding cable-stayed supports: Set up cable-stayed supports above or on both sides of the plank road. One end of the cable-stayed support is fixed at a solid part of the grotto wall, and the other end is connected to the corresponding position of the plank road.

### 6.2.2. Strengthening node connections

Improving stone-built node connections: For the nodes of the stone-built plank road, adopt new stone connection technologies.

Strengthening wooden plank road node connections: For the nodes of the wooden plank road, use anti-corrosion-treated high-strength wood and reinforce them with metal connectors.

### 6.2.3. Replacing damaged components

Replacing damaged stones: Replace the damaged, cracked, or severely weathered stones in the stone-built plank road.

Replacing decayed wood: Replace the decayed parts of the wood in the wooden plank road in a timely manner.

### 6.2.4. Surface protection treatment

Applying protective coatings: Apply special protective coatings on the surface of the plank road to improve its durability and corrosion resistance. For example, apply epoxy-resin-based protective coatings, which have good adhesion and corrosion resistance and can form a solid protective film on the surface of the plank road.

Setting waterproof layers: Set waterproof layers at the bottom and sides of the plank road to prevent rainwater from penetrating into the internal structure of the plank road.

## 7. Conclusion

Through the research on the seismic response mechanism and safety assessment of the plank road at Beishi Grottoes in Qingyang, the following conclusions are obtained.

The structural response parameters, such as displacement, stress, and strain of the plank road at Beishi Grottoes in Qingyang under earthquake action, are mainly concentrated at the nodes and connections of the plank road, while the strain response is mainly concentrated at the bottom and sides of the plank road.

The damage degree of the plank road is evaluated using the analytic hierarchy process and fuzzy comprehensive evaluation method, and the safety level of the plank road is divided into four levels: safe, basically safe, with safety concerns, and dangerous <sup>[15]</sup>.



The basic principles of seismic design and reinforcement measures are proposed, and the effectiveness of the reinforcement measures is verified through finite-element model analysis and field tests.

This study provides a theoretical basis and technical support for the seismic safety assessment of grotto plank roads in the context of intangible cultural heritage protection, which is of great practical significance for protecting this intangible cultural heritage. At the same time, this study also provides references for the seismic safety assessment of other similar ancient buildings and cultural heritages.

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## Disclosure statement

The author declares no conflict of interest.

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# Chinese College Students' Understanding of the Pink Tax: Analyzing Awareness Levels and Contributing Factors

Zhiyuan Xiao<sup>1</sup>, Yu Hou<sup>2\*</sup>, Haorui Li<sup>3</sup>

<sup>1</sup>Beijing Normal-Hong Kong Baptist University, Zhuhai 519087, Guangdong, China

<sup>2</sup>Law school, Zhengzhou University, Zhengzhou 450001, Henan, China

<sup>3</sup>Aberdeen Institute of Data Science and Artificial Intelligence, South China Normal University, Foshan 528225, Guangdong, China

*\*Author to whom correspondence should be addressed.*

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**Abstract:** This study investigates Chinese college students' awareness of the "pink tax", a gender-based pricing phenomenon where female-oriented products cost more despite having similar functions as male-oriented counterparts. Drawing on attribution theory, the research examines both internal factors (such as gender, personal values, and consumption habits) and external influences (such as media exposure and cultural norms) that shape students' awareness. Employing a mixed-methods design, the study integrates a large-scale questionnaire with semi-structured interviews across five awareness levels. Quantitative data reveal varying levels of pink tax awareness, while qualitative interviews explore the deeper reasons behind these perceptions. The study highlights a general lack of in-depth understanding and legal literacy about the pink tax, calling for enhanced consumer education and legislative efforts. The study concludes that increased awareness is essential for promoting fair pricing and gender equality in the Chinese consumer market.

**Keywords:** Pink tax; Gender-based pricing; Chinese college students; Attribution theory; Consumer awareness

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## 1. Introduction

In 2015, a study by the New York City Department of Consumer Affairs found that women's products cost about 7% more than men's products. This phenomenon, known as the "pink tax", refers to the higher pricing of products for women without a real difference in value <sup>[1]</sup>. In China, the pink tax is also prevalent due to gender stereotypes that position women as high consumers, leading to more expensive female versions of products to increase profits <sup>[2]</sup>. This perpetuates market disorder and reinforces gender inequality. Therefore, it is crucial to explore Chinese university students' awareness of the pink tax and the factors influencing this awareness, which can also propose solutions to address the pink tax and suggest directions for future research.



## 2. Literature review

Studies show that university students are aware of the pink tax. Still, they are only limited to the definitions and levels of practice observed in various products, and most of them see the application of the pink tax in different hygiene or personal care products<sup>[3]</sup>. Many see the pink tax as unfair and discriminatory, worsening gender bias in pricing. The influencing factors are divided into internal (personal experiences with gender-based products) and external (media influence calling attention to the pink tax)<sup>[4-5]</sup>. However, there are research gaps, particularly a lack of studies on the pink tax in China focused on college students. Few studies use mixed methods to explore awareness levels and influencing factors. But for college students, who are trend-conscious and have more requirements for the appearance of products, they will always be impacted by the pink tax more<sup>[6-7]</sup>. Furthermore, gender-based pricing undermines consumer equality and reinforces stereotypes, and public awareness needs to be studied<sup>[3-4]</sup>. So learning the awareness levels of Chinese university students and the influencing factors is also crucial.

### 2.1. Theoretical framework

Considering research objectives and combining with the literature review, Attribution theory, which explores how people explain the causes of cognition through internal and external factors, can guide this research in understanding what influences college students' awareness levels of the pink tax<sup>[5]</sup>.

### 2.2. Methodology

This research uses a hybrid approach, combining quantitative and qualitative methods, as they complement each other<sup>[8]</sup>. Quantitative research, based on positivism, collects large-scale data to understand the intuitive reflection of consumer cognitive level and gender ratio differences. Qualitative research, based on interpretivism, delves into the perspectives, motivations, and emotions of individuals to explore what factors lead to the existence of corresponding levels of consciousness.

### 2.3. Quantitative research

As the research aims to explore a relatively new topic in depth, a semi-open questionnaire survey is chosen as the exploratory survey and is expected to last for three months. The research focuses first on college students from universities in Zhuhai, where the researchers are located, before further radiation. A sample size of 2000 people will be selected, and the questionnaire will be published online on campus walls and forums that require real name authentication.

Based on a study of pink tax perception among young Filipino consumers and the Likert Five Point Scale, a basic questionnaire was developed (**Figure 1**). Responses are categorized into five levels of awareness: “very clear”, “relatively clear”, “vague”, “not very clear”, and “completely unaware.” Descriptive statistical analysis will be used to determine the number of respondents and their gender ratios at each awareness level.

### Survey on Chinese college students' awareness of pink tax

Hello! We are the research team of Beijing Normal University and Hong Kong Baptist University United International College. We are now collecting data on your "degree of awareness of pink tax". It is estimated to take 3-5 minutes. We sincerely ask for your assistance!

This survey is conducted anonymously and on a voluntary basis. If you feel uncomfortable, you can choose to withdraw at any time.

I solemnly promise that this survey is only for academic research and will not bring you any adverse effects or inconvenience. There is no right or wrong answer, and this study will keep your answer strictly confidential!

\*3. Have you ever noticed that there are price differences between men and women when purchasing similar types of goods or services?

☐ yes

☐ No

\*1. Gender

☐ male

☐ female

☐ other \_\_\_\_\_

\*2. Grade

☐ Freshman year

☐ Sophomore year

☐ Junior year

☐ Senior year

\*4. Are you aware of a phenomenon called "pink tax" that refers to the fact that female consumers may have to pay higher prices for the same conditions?

☐ very clear about its definition

☐ relatively knowledgeable

☐ vague

☐ Don't know much

☐ I don't know at all (never heard of it)

\*5. Which of the following commodities have you noticed the "pink tax" phenomenon? [Multiple choice]

☐ Personal care products (such as skin care products, shampoo, etc.)

☐ Beauty products (cosmetics, hair products, etc.)

☐ Clothing and accessories (clothes, shoes, etc.)

☐ Health care products (vitamins, supplements, etc.)

☐ Service industry (barber shop, gym, etc.)

☐ other

6. If you have any opinions on the "pink tax" phenomenon, you can use the space below to express your views

7. We will conduct more in-depth research in the future. If you are interested in our research, please leave your contact information (phone number)

**Figure 1.** Online questionnaire for college students in Zhuhai

## 2.4. Qualitative research

A semi-structured interview method will be used, employing Homogeneous Sampling. In terms of sample size selection, six individuals from each of the five awareness levels identified in the quantitative research will be selected, maintaining the gender ratio (e.g., 2 males and 4 females). A total of 30 individuals will be interviewed.

Research recruitment (**Figure 2**) is provided, and the interview guideline (**Figure 3**) where some questions are provided from the perspectives of internal and external factors to guide the interviewees' thinking. Data analysis will use theoretical analysis based on inductive reasoning and tools such as NVivo to analyze the specific responses and reactions of five groups with different awareness levels, which can be extended to some common awareness situations in today's society.

The poster is titled "Research Recruitment" in large, bold, black font. Below the title, it lists the following details: Subject: College students, Language: Mandarin, Duration: Estimated 60 minutes, Method: Online interview, and Tool: Tencent Conference. The research topic is "Exploring the degree of Chinese college students' cognition of pink tax and its influencing factors". The introduction states that the research team from Beijing Normal University-Hong Kong Baptist University United International College is conducting a study on college students' awareness of the pink tax. The confidentiality principle states that personal information will be kept strictly confidential, recordings will be kept confidential and used for academic research purposes only, and the study is voluntary with the right to withdraw at any time. Participants will be paid 100 yuan per hour. The contact information is provided at the bottom: If you are interested in this study, please send an email to [s230032009@mail.uic.edu.cn] with "Pink Tax Study recruitment" in the subject line and we will arrange an interview with you as soon as possible.

**Research Recruitment**

Subject: College students      Language: Mandarin  
Duration: Estimated 60 minutes      Method: Online interview  
Tool: Tencent Conference

**Research Topic:**  
Exploring the degree of Chinese college students' cognition of pink tax and its influencing factors

**Introduction**

- ▶ We are a research team from the Beijing Normal University-Hong Kong Baptist University United International College and are conducting a study on college students' awareness of the pink tax. Through in-depth interviews and case studies, we hope to reveal deeper insights and provide deeper understanding and coping strategies for underlying sexism.

**Confidentiality principle**

- ▶ Your personal information will be kept strictly confidential;
- ▶ Recordings of the interviews will be kept confidential and used for academic research purposes only;
- ▶ The study is voluntary and you have the right to withdraw at any time if you feel any discomfort.

**Participants will be paid 100 yuan per hour**

If you are interested in this study, please send an email to [s230032009@mail.uic.edu.cn] with "Pink Tax Study recruitment" in the subject line and we will arrange an interview with you as soon as possible.

Figure 2. Research recruitment for semi-structured interviews

#### Interview guidelines for semi-structured interview

Hello, thank you for participating in our research. The purpose of this interview is to understand your understanding and opinion on the pink tax (where female products are priced higher without actual value differences). Your answer will help us gain a deeper understanding of the understanding and influencing factors of this phenomenon among Chinese university students. Please answer based on your true thoughts and experiences. Thank you.

#### Internal factors

##### Personal values and experiences:

How important do you think gender equality is in society? Why?

How do you view the phenomenon of price differences caused by gender differences?

Have you ever purchased women's products that are significantly more expensive than men's products? Please provide a detailed description of your experience.

Have your family or friends had similar experiences? Have these experiences influenced your perspective?

##### Gender and product requirements:

What factors do you usually prioritize when purchasing products, such as brand, appearance, functionality, etc?

Do you think women are priced higher in certain product categories? What category? Why?

##### Economic situation and consumption capacity:

How does your financial situation affect your consumption choices?

How sensitive are you to product prices? Will the pink tax affect your purchasing decision?

#### External factors

##### Gender roles in social and cultural positioning:

What do you think are the different expectations of society for the consumption needs and behaviors of men and women?

How do you think these socio-cultural expectations affect product pricing?

##### Policies and regulations:

Do you know that there are relevant laws or policies in China to regulate the phenomenon of the pink tax?

What measures do you think the government should take to reduce or cancel the pink tax?

##### Marketing and media coverage:

Have you noticed pricing strategies with gender differences in marketing? Please provide an example for an explanation.

Have you seen any media coverage of the pink tax phenomenon? Have these reports changed your perspective or behavior?

#### Summary

What do you think is the most effective way to raise public awareness of the pink tax phenomenon?

Do you want to share any other thoughts or suggestions about the pink tax with us?

Thank you again for your participation! Your answer will provide valuable insights for our research.

**Figure 3.** Interview guidelines for semi-structured interview

### 3. Expected results

The expected results will also be analyzed based on attribution theory from both external and internal factors. Internal factors such as personal values, gender, consumption habits, and economic conditions determine an individual's sensitivity to gender-based pricing. External factors such as social and cultural norms, government policies, marketing, and media coverage can influence the broader context in which these concepts are formed.

### 4. Limitation

Gender was restricted initially, and the results may not equally apply to individuals with different gender identities. As a big-scale study, specific policies in different regions may affect the prediction results. Moreover, the sample size of qualitative research cannot include college students from all economic, cultural, and social backgrounds, which affects the universality of the result.

### 5. Further discussion

Research on the pink tax is still in its early stages <sup>[5]</sup>. There are many areas to explore in the fight for gender equality in the consumer market. And promoting awareness of the pink tax is crucial for fair pricing and gender equality <sup>[3]</sup>.

Consumers, often, they are unaware of the pink tax and accept higher prices without questioning them <sup>[9]</sup>. This leads to ingrained purchasing habits and unnoticed consumption traps. It is important to educate consumers about this discrimination so they can advocate for their rights and help others.

For legislators, as the phenomenon of the pink tax is only a value judgment and not a legal basis, it is hard to link the pink tax and price discrimination based on gender differences in the law <sup>[10–11]</sup>. Therefore, increased awareness can drive policy formulation, review, and improvement of existing laws <sup>[5]</sup>.

For businesses, understanding the impact of the pink tax on consumers is essential. Small price differences add up to significant costs <sup>[12]</sup>. When consumers recognize this discrimination, they may choose alternative products, which ultimately harms the businesses using these pricing strategies <sup>[3]</sup>.

### 6. Conclusion

The development of pink tax awareness in the Chinese market still requires joint efforts from multiple aspects to achieve gender equality in the consumer market and more just and sustainable social development.

### Disclosure statement

The authors declare no conflict of interest.

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# Research on Blended Teaching of College English Writing under the Concept of Content Language Integration

Hui Zhang\*

Dalian Jiaotong University, Dalian 116000, Liaoning, China

*\*Author to whom correspondence should be addressed.*

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**Abstract:** With the in-depth development of education informatization and the improvement of students' comprehensive English ability, college English writing teaching needs an innovative mode to meet the new needs. College English writing teaching is the core link of cultivating students' comprehensive language ability, and its quality is directly related to students' cross-cultural communication level and future development. However, the traditional teaching methods have been difficult to meet the current teaching needs. The combination of content language integration teaching (CLIL) and blended teaching mode has brought new opportunities for college English writing teaching. This innovative teaching mode can effectively integrate students' language knowledge and practical application, and enhance their comprehensive language application ability. This paper elaborates on the theory of content language integration (CLIL) and blended teaching, deeply discusses the advantages of college English writing blended teaching under the concept of content language integration, and puts forward the implementation strategy of college English writing blended teaching under the concept of content language integration, aiming to provide theoretical and practical reference for improving the quality of college English writing teaching and cultivating high-quality English talents to meet the needs of the times.

**Keywords:** Content language integration concept; Blended teaching of college English writing

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## 1. Introduction

Under the trend of globalization, English as a key tool of international communication, its teaching quality has aroused widespread concern. As a key link to cultivate students' comprehensive English ability, college English writing teaching is very important to enhance students' intercultural communication ability and thinking ability. However, the traditional teaching mode has some limitations, which make it difficult to meet the requirements of the new era for students' language application ability. The application of CLIL in the blended teaching of college English writing will help to break through the bottleneck of the traditional teaching mode and inject new impetus

into the cultivation of students' comprehensive English application ability.

## **2. Overview of relevant theories**

### **2.1. Content language integration concept (CLIL)**

CLIL teaching philosophy emphasizes the deep integration of language teaching and subject content, so that students can improve their language application ability while learning professional knowledge. Its characteristics include: relying on the subject content, paying attention to the practical application of language; Emphasizing students' active participation and collaborative learning; cultivating critical thinking and innovation ability. This concept emphasizes the mutual promotion of content and language in the process of learning, rather than the simple training of language form.

### **2.2. Blended teaching theory**

Blended teaching is a teaching mode that combines traditional classroom teaching with network teaching in the digital era. It combines the advantages of traditional classroom and multimedia classroom, and transforms teacher-centered teaching into student-centered interactive activities. This teaching mode can give full play to the role of both teachers and students, improve learning initiative and teaching effect. In hybrid teaching, teachers focus on explaining and answering questions in class, and students can use the network platform for autonomous learning, communication, and discussion to realize personalized learning <sup>[1]</sup>.

### **2.3. Theoretical basis for the combination of the content language fusion concept and blended teaching**

First, according to the theory of second language acquisition, language learning is not a mechanical process, but occurs naturally. Only when learners are exposed to meaningful situations, touch and use the language, can they be expected to master the language efficiently. Under the framework of the concept of content language integration, students use English to write in real and meaningful scenes with the help of learning rich subject content, which is highly consistent with the law of second language acquisition, and is quite beneficial to improving the quality of language input and output.

Second, constructivist learning theory emphasizes the importance of learners' active participation and knowledge construction. Blended teaching mode creates a diverse learning environment for students and provides rich learning resources. Students can independently study writing knowledge and related subject content online, and build a knowledge system according to their own cognitive level and learning rhythm. In the offline classroom, students can further improve and revise their knowledge construction by interacting with teachers and classmates, such as participating in group discussions, peer review, and other activities <sup>[2]</sup>.

## **3. The advantages of blended teaching of college English writing under the concept of content language integration**

### **3.1. Enhance students' interest and confidence in writing**

The traditional writing teaching mode is relatively simple, which can easily cause students' fear of difficulties in writing. The rich and diverse subject content under the concept of content language integration adds freshness to writing, so as to stimulate students' interest in writing. For example, novel topics such as "space exploration" and



“virtual reality technology” can attract students’ attention and make them more willing to devote themselves to writing. The hybrid teaching mode enables students to know their progress and shortcomings in time and gradually enhance their confidence in writing through diversified teaching activities and instant feedback, such as online intelligent correction and offline comments from teachers and peers.

### **3.2. Improve the ability of autonomous and collaborative learning**

In the online learning link of blended teaching, students must plan their own learning time and choose their own learning content, which is of great benefit in cultivating students’ autonomous learning ability. For example, students can learn grammar, vocabulary, or writing structure online according to their weaknesses in English writing. Offline activities such as group discussion and cooperative writing have created opportunities for students’ collaborative learning. Just like in the “cross-cultural communication” theme writing, students work in groups to explore the differences in communication under different cultural backgrounds, and complete the writing task together. In this process, they learn to listen to others’ opinions, divide their work, and cooperate, so as to improve their teamwork ability.

### **3.3. Promote the internalization and transfer of knowledge**

The integration of content and language enables students to simultaneously carry out English writing while studying subject knowledge. In this way, they can more thoroughly understand and grasp knowledge and effectively translate it into language skills. For example, after studying the relevant content of “historical and cultural heritage protection”, students not only know the important significance and specific methods of cultural heritage protection, but also can accurately explain these views in English, achieving the internalization and transfer of knowledge from content comprehension to verbal expression. In the hybrid teaching mode, online learning provides students with a large number of learning resources to choose independently, while offline teaching helps students apply the online knowledge to practical writing through interactive activities, so as to further promote the internalization and transfer of knowledge<sup>[3]</sup>.

## **4. Implementation strategy of blended teaching of college English writing under the concept of content language integration**

### **4.1. Carefully plan the teaching process**

First, make preparations before class. In the blended teaching of college English writing under the concept of content language integration, pre-class preparation is an important start. Teachers should carefully select writing topics according to the curriculum standards, students’ English level, and professional characteristics. After setting the theme, teachers should comprehensively collect and sort out relevant subject knowledge materials. These data come from a wide range of sources, including cutting-edge research reports from professional academic databases, dynamic information from industry authoritative websites, and relevant chapters of professional books. At the same time, teachers should prepare rich English writing learning resources. Collect all kinds of excellent English model essays, covering different styles and genres, such as argumentative papers, expository texts, research reports, etc., so that students can be exposed to a variety of writing paradigms. After completing the resource preparation, teachers release learning tasks with the help of an online learning platform, which should be clear and operational. At the same time, students are encouraged to share initial ideas in the platform discussion area and interact with classmates. Teachers should pay attention to the discussion trends in time, reply to and guide

students' questions and views, ensure that students have a comprehensive understanding of the writing theme and knowledge before class, and make full preparations for classroom learning.

Second, enrich classroom interactive activities. The classroom is the key to students' knowledge internalization and skills improvement. In the process of classroom teaching, teachers can carefully organize various activities, such as group discussion, case analysis, and brainstorming, so as to guide students to make full use of what they have learned before in writing conception and expression. For example, the teacher puts forward relevant questions around the theme of writing, such as asking "which scientific and technological products have completely changed people's way of communication" in response to the theme of "the change of life by technology", and then asking students to discuss in groups. After the discussion, each group will send representatives to speak and share the results of the group discussion. In this process, teachers give guidance and feedback in real time. Once students are found to have grammatical errors or unclear logic, teachers will correct and guide them in time. At the same time, teachers can also organize writing exercises. For example, arrange fragment writing to let students describe the specific impact of a certain scientific and technological product; Or write an outline to sort out the overall framework of the article on the theme of "the impact of technology on life." Through these practical activities, students' writing ability can be effectively improved <sup>[4]</sup>.

Third, expand, consolidate, and improve after class. In the after-school stage, students carefully complete the writing task according to the content learned in class, and then upload it to the network platform. Teachers should carefully correct and comprehensively evaluate the assignments submitted by students, and give personalized feedback and practical suggestions according to the specific situation of each student. Encourage students to use the network platform to carry out full communication and positive interaction. Here we share our learning experience, learn from each other's advantages, and make progress together. In addition, teachers can also assign some expanding tasks. For example, recommend students to read relevant English literature to help students broaden their knowledge and improve their language literacy; Encourage students to participate in the online writing competition, and let students exercise their ability in the competition environment. Through these activities, students' English writing level can be further improved.

## **4.2. Integrating teaching resources**

Integrating high-quality network resources is of great significance to enrich teaching content and improve teaching quality. There are many high-quality resources related to English writing on the Internet, such as online courses, academic papers, news reports, video materials, etc. For example, the online writing course in a well-known foreign university is taught by a team of professional teachers, covering all aspects from basic skills to advanced academic writing. Students can learn various writing styles and skills and broaden their writing horizons. Academic papers provide authoritative expression and argumentation ideas in the professional field, and students can learn to elaborate argumentation views in rigorous language. The timeliness and practicability of news props enable students to learn current popular expressions and hot topic vocabulary, so as to make writing closer to reality. Video materials such as TED speeches and English movies vividly show the use of English in different scenes. Teachers should screen and recommend these resources according to the teaching content and students' situation, and provide students with rich and diverse learning materials <sup>[5]</sup>.

In addition, the development of school-based teaching materials suitable for the students is also a top priority. School-based textbooks can closely relate to the professional characteristics and learning needs of students in the school, and realize the deep integration of subject knowledge and language learning. For students majoring in

science and engineering, the school-based textbook can select the writing cases of artificial intelligence, aerospace technology, and other related topics. Taking the application of artificial intelligence in the medical field as an example, the usage of professional terms such as “artificial intelligence diagnosis”, “medical data analysis by AI”, and the structure and common expressions of scientific and technological documents, such as scientific research reports and project plans are explained in depth.

For liberal arts majors, school-based textbooks focus on humanities and social sciences such as literary appreciation and social issues. Taking literary appreciation as an example, this paper expounds on the differences in English expressions of different literary genres, and how to use English for work appreciation, theme interpretation, and other writing. Provide writing templates. For example, the structure of “Introduction — summary of the work — analysis of themes — writing style — conclusion” can be used to analyze literary works to help students quickly build a writing framework. At the same time, it summarizes the commonly used expressions, such as “the underlying theme of”, “convey the idea of”, which are commonly used in appreciating the theme of literary works, so as to make students’ writing expression more accurate and coherent.

School-based textbooks can also be designed according to students’ English level. For students with a weak foundation, focus on strengthening the basic knowledge, explanation, and basic writing ability training, such as standardizing sentence structure, accumulating core vocabulary, etc. For students with a solid foundation, it provides more challenging content, such as the use of complex rhetoric, professional vocabulary replacement, etc., to meet the learning demands of students at different levels, and help students better master writing methods and skills.

### **4.3. Optimize teaching evaluation methods**

First, multiple evaluation subjects are in parallel. Teachers’ evaluation, students’ self-evaluation, and peer evaluation are integrated. Teachers evaluate students’ writing content, language expression, and logical structure from a professional perspective. Through self-assessment, students review their learning process and writing achievements, and perceive their own advantages and disadvantages. Peer evaluation can promote students’ learning and communication.

The second is the combination of process evaluation and summative evaluation. It not only attaches importance to students’ final writing achievement, but also pays attention to the evaluation of students’ learning process. By recording students’ participation in online learning, actual performance in offline classes, and the revision process of writing drafts, teachers can fully understand students’ learning status. For example, based on the students’ progress in many writing exercises and their initiative in participating in discussions, the process evaluation is given, and then combined with the final evaluation, such as the final exam, the students’ learning effect is comprehensively evaluated. The final evaluation result is obtained from the process evaluation and summative evaluation according to a certain proportion. For example, the process evaluation accounts for 40% of the total score, and the summative evaluation accounts for 60%, so as to ensure the comprehensiveness and impartiality of the evaluation results <sup>[6]</sup>.

## **5. Conclusion**

To sum up, based on the concept of content language integration, college English writing adopts the blended teaching mode, which can effectively improve students’ English writing ability and comprehensive quality. This

teaching method gives full play to the advantages of the integration of content and language, enriches the form of writing teaching, meets the students' personalized learning needs, and cultivates the students' ability of autonomy and cooperation. In the specific implementation, teachers should constantly improve their own quality, integrate teaching resources, design practical learning activities, and guide students to actively participate. At the same time, teachers should strengthen the tracking and evaluation of the learning process, so as to continuously improve the quality of college English writing teaching and cultivate high-quality English talents who meet the needs of the times.

## Disclosure statement

The author declares no conflict of interest.

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# Benchmarking and Goal-Driven Approach for Developers for 4.0 Industrial-level Applications inside Siemens

**Murtaza Hussain Shaikh\***

Kyungsung University, 309 Suyeong-Ro, Nam-Gu, Busan, Republic of Korea

*\*Corresponding author: Murtaza Hussain Shaikh, [murtaza@ks.ac.kr](mailto:murtaza@ks.ac.kr)*

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**Abstract:** Benchmarking, a crucial technique in the context of Siemens' industrial applications, is widely recognized for identifying and enhancing key skills. This work presents a goal-driven approach to requirement interpretation, explicitly focusing on the role of benchmarking within the company. It explores the benchmarking methodology, the process of developing new industrial applications through benchmarking, and the essential steps involved. The findings indicate that benchmarking can be a fundamental learning tool for skill development and optimization, ultimately contributing to long-term competitive advantage. The study examines various aspects of Siemens' operations and proposes an alternative framework for categorizing benchmarking activities. The methodology outlined in this research is designed to support specialists, academicians, and professionals in assessing the evolution and relevance of benchmarking as a strategic tool, given Siemens' prominent role in industrial development. The proposed benchmarking methodology offers several remunerations, such as improved user engagement and creating more effective and aesthetically appealing interfaces. Despite its significance, existing literature provides limited insights into integrating benchmarking techniques into industrial applications development strategies. This study introduces a methodology particularly beneficial for front-end developers, enabling them to implement visually engaging and interactive elements within industrial-level applications. By enhancing user engagement, the proposed approach supports the creation of more effective and aesthetically appealing interfaces. While the study provides a descriptive analysis of benchmarking techniques, further refinement is needed in the current target selection and computation methods. Future research should focus on sharpening these aspects to enhance the practical application of benchmarking in industrial web development.

**Keywords:** Applications; Benchmarking; Industrial; Interface; Methodology; User interfaces

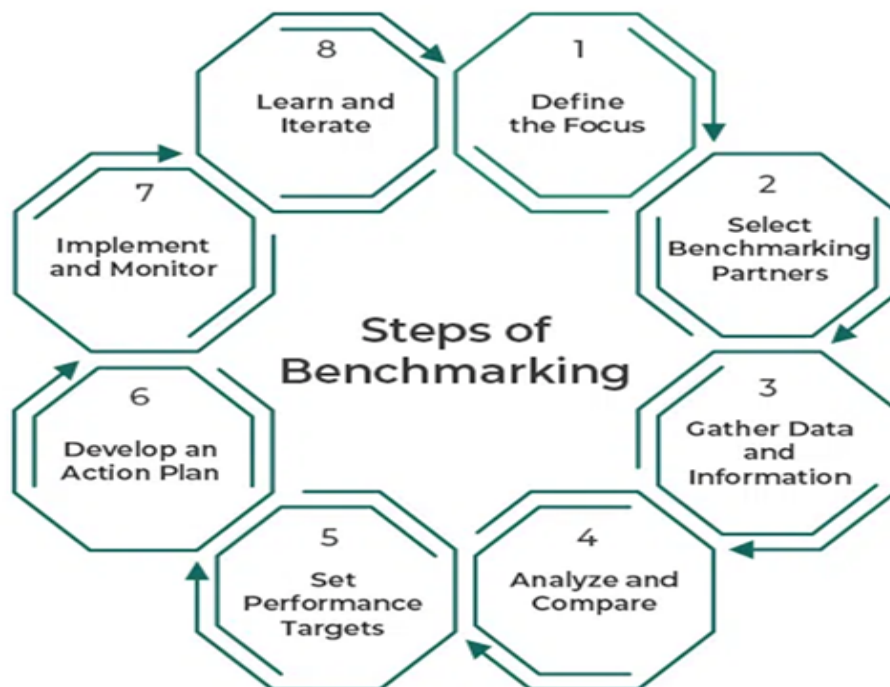
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## 1. Introduction

The benchmarking idea is often perceived as a demonstration of mimicking or replicating. However, in reality, this concept facilitates advancement rather than impersonation. Benchmarking is a relative strategy in which a firm



identifies accepted procedures and then seeks to align its performance with best practices. It serves as a reference point for measurement, and when applied to work processes, it yields superior results <sup>[1]</sup>. To excel, a firm must exceed these benchmarks. Different fields utilize various kinds of benchmarking. For instance, if someone aims to benchmark for service quality improvement, then service quality benchmarking is applied. Benchmarking practices can be implemented in any field, each with its own methodology. This study applies the central concept of benchmarking to create user interfaces for industrial-level applications <sup>[2]</sup>. Benchmarking, in this context, is not about copying existing interfaces, but about learning from them to create better, more user-friendly interfaces. The significance of this work lies in the importance of user engagement in interface design. By enhancing user engagement, the proposed approach supports the creation of more effective and aesthetically appealing interfaces, making the audience feel the significance of their work <sup>[3]</sup>. **Figure 1** illustrates the method used in this study and the steps required to perform benchmarking for developing web app interfaces. Organizations employ benchmarking to enhance every aspect, such as service quality and management improvement. The foundational concept in benchmarking is comparison, but the key is identifying the data needed for comparison and what to compare <sup>[4]</sup>. Data collection is the core principle of the entire benchmarking process. Later in the methodology section, benchmarking will be briefly explained, demonstrating to developers how to conduct benchmarking for creating industrial-level applications. This proposed methodology can also be applied in various fields, such as website creation and improvement. Industrial-level application interfaces involve user interaction with mouse and keyboard devices and are the most critical and adaptable software component <sup>[5]</sup>. The goal is to create an interface that is easy to use, meets future users' needs, and provides users with the tasks they wish to undertake. User interfaces for industrial-level applications engage users who utilize the web to complete required tasks on the website. Industrial-level applications offer a straightforward interface for accessing web services over the Internet. User interfaces define what users require concerning the look and feel of a software system and what software engineers must grasp based on user requirements <sup>[6]</sup>.



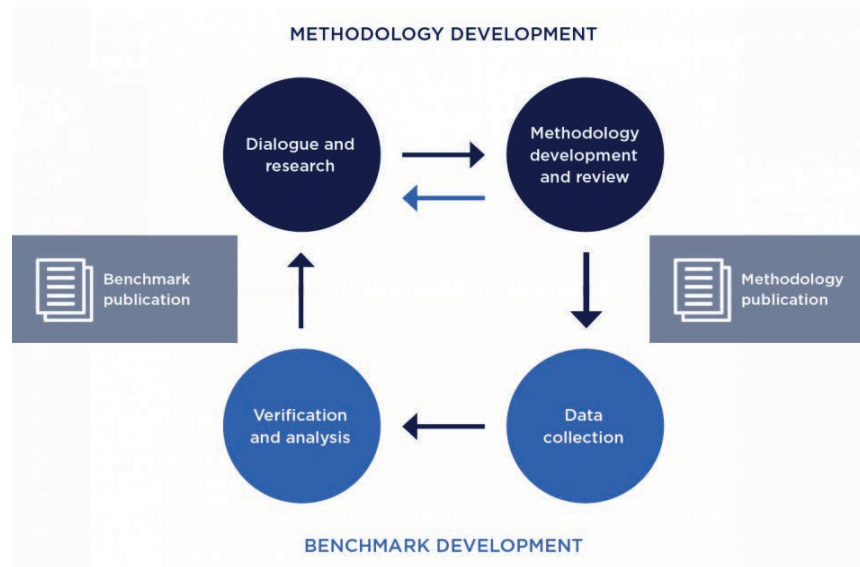
**Figure 1.** Basic benchmarking

However, software engineers sometimes develop user interfaces with minimal or no support from professional designers. In the ongoing pursuit of business expansion, many companies, including Siemens, are turning to web technology for its potential to drive innovation. This research will explore why these characteristics are relevant for this work. First, external visitors' accessibility to industrial-level applications leads to a diverse user base. Most web apps are designed to cater to various groups of users. Interestingly, web apps may also be visited by unknown users who it was not intended to serve. Second, technologies rapidly evolve to keep up with the competitive Web environment. New types of organization, programming, and hardware advancements are driving progress to meet the increasing traffic <sup>[7]</sup>. These cutting-edge technologies enable firms to offer new services on their apps that current Internet users have never imagined. This potential for innovation in industrial applications is both inspiring and motivating. These characteristics make website compilation and improvement more tactical, involving more domain ambiguity than traditional information systems <sup>[8]</sup>. Benchmarking is a valuable tool to address these challenges, providing a structured approach to problem-solving. Web app interface benchmarking creates a single design interface by collecting data from other, superior web apps, identifying their strengths and weaknesses, and determining the creation requirements. The focus is on four key aspects of industrial-level applications interface benchmarking. First, it enables the discovery of sources for new methods of doing things beyond one's party, enlightening the developers and making them open to change. Second, benchmarking can help concretize customer requirements. Third, benchmarking can break from the inspection approach, limiting the improvement scope <sup>[9]</sup>.

## 2. Methodology and identification

The proposed benchmarking methodology to enhance industrial-level web interfaces will now be presented. The process begins with identifying individuals working on or using similar industrial-level applications. Effective surveys yield significant results, directly influencing the suggested methodology's next phase <sup>[10]</sup>. Thus, gathering insights from web app users or experts with extensive experience with these applications is essential. The priority vector obtained from the survey is inherently linked to the priorities of the goal list. The outline process quantitatively analyses the results and identifies relationships among varying responses. The conclusions drawn from this analysis can then be communicated to the broader audience from whom the model was derived <sup>[10]</sup>. Once the results are received, developers should create a comprehensive overview of their objectives and recognize the broader aims they hope to achieve. **Figure 2** depicts the benchmarking methodology development model at Siemens, detailing the entire journey from benchmarking publication to methodology publication at the company. This model is not just a theoretical concept, but a practical guide developers can use to enhance their industrial-level web interfaces.

At this point, focus should be on more modest targets that need to be achieved to accomplish the objectives. First is the prioritized goal list, and the second step is the preliminary analysis of this goal list. When prioritizing the goals, developers must list them <sup>[11]</sup>. Each goal specifies its category; for example, if the developers have a goal to create an effective interface for the login page, then in this category, they need to benchmark the elements required for the login page of the web app. Several elements, such as a username, ID, or password, are essential for logging into the app. The key is how to design a web application's login page to be more effective for users <sup>[11]</sup>. Effectiveness can be assessed through benchmarking in further steps. Another essential consideration in this phase is prioritizing goals in the goal list (e.g., most users open new feeds in the web application compared to other fields, so more attention should be paid to creating the new feeds section) <sup>[12]</sup>.



**Figure 2.** Methodology development of benchmarking at Siemens

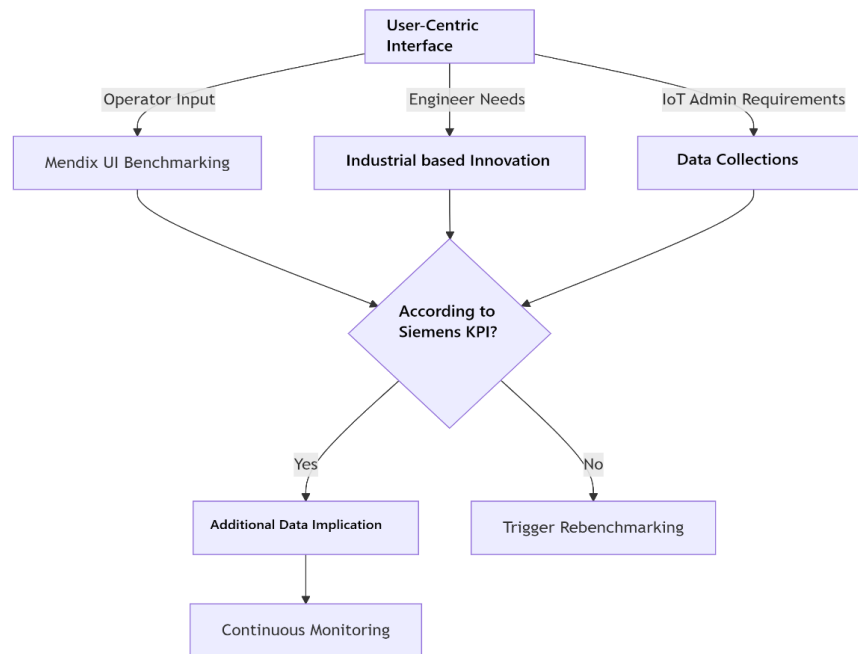
### 3. Preliminary analysis of proprietary benchmarking framework

The central concept of the preliminary analysis step is to uncover goals not identified in the goal identification stage. Second, the priorities of these goals should be measured; third, goals that are not addressed in the methodology for various reasons, such as financial constraints, should be eliminated <sup>[12]</sup>. Data can be collected differently, but this paper discusses three sub-steps of benchmarking data for creating a new user interface for industrial-level applications. First, developers list the necessary data they wish to benchmark, then identify the data sources, i.e., where to find relevant field data. The third step involves additional data that developers want to include <sup>[6]</sup>. This extra data refers to unique fields about their organization that may be found on specific websites. Therefore, developers integrate these fields by gathering information from individuals involved with that specific clinical website. In the initial data collection step, developers compile a list of the necessary data for developing interfaces. For example, when creating a clinical website application, developers need fields related to medical terms and those already on the website <sup>[11]</sup>. In the second step, developers must locate the data sources. In this step, they create data sources with different functionalities and fields, compiling a list of all applicable applications. After selecting additional data from web apps, developers assess their efficiency. In the third step of data collection, supplementary information is compiled. Developers add extra fields after obtaining the benchmark data and data sources. At this stage, developers create a list of the data compiled by the firm's team. Developing a web app is a complex task that requires several steps <sup>[13]</sup>.

The user interface design is essential in appealing to customers, so the firm must include unique additional information compared to other industrial-level applications. This extra data implies that unique fields about their organization are sometimes found on specific websites <sup>[3]</sup>. Figure 3 shows Siemens' user-centric interface benchmarking process, where different developers, engineers, and administrators gather the evaluation of Mendix and industrial innovations through data collection <sup>[14]</sup>. The method checks if results meet Siemens KPIs—if yes, it proceeds to continuous monitoring; if no, it triggers re-benchmarking with additional data. The cyclical workflow ensures interfaces are optimized for both usability and technical performance. Benchmarking many web applications is quite challenging; thus, the second step involves selecting target applications. After that, the



developers finally chose the target web apps for the benchmarking activity <sup>[10]</sup>. During this phase, developers take the interface design from the target web apps and compare those interfaces.



**Figure 3.** User-centric interface benchmarking

#### 4. Target benchmarking and use case synthesis

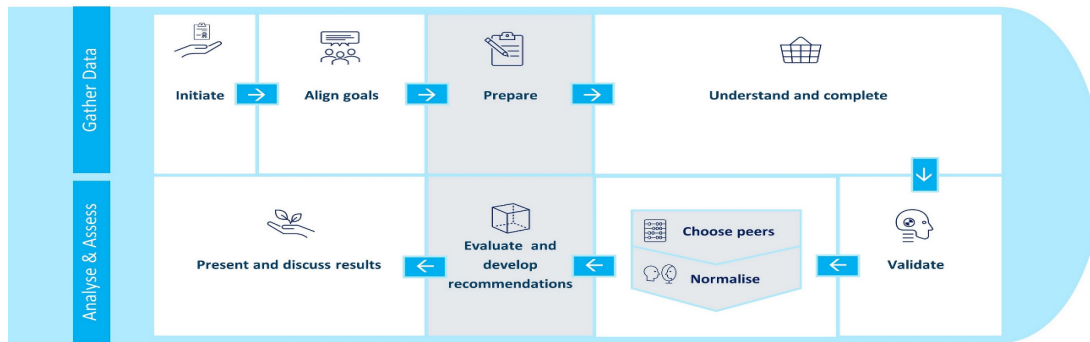
This stage produces use cases that consider the objectives. All of the target web destinations inspire use cases that assist each objective. The three most prominent rules are followed in analysing the goals and synthesizing use cases. Rule one corresponds (i.e., every menu or site guide field can relate to one use case). Rule two is splitting (i.e., if one field in a menu contains multiple targets, one use case is shared into many sections). The last rule is coalescing (i.e., if too many use cases are produced, they might be consolidated into one as per the accompanying rules) <sup>[5]</sup>.

A complete use case list of the improved web-based industrial application is generated from synthesizing the use case analysis results. The possibility, execution cost, and relevance of each utilization case should be considered so that infeasible, irrelevant, or costly use cases can be excluded <sup>[13]</sup>. **Figure 4** outlines a systematic benchmarking process inside Siemens is divided into two key phases: the initial gather data stage, where teams align goals, prepare resources, and define the benchmarking scope; followed by the analyse and assess phase, where collected data is normalized, validated, compared against peers, and transformed into actionable recommendations—creating a straightforward workflow from preparation to data-driven decision-making <sup>[14]</sup>.

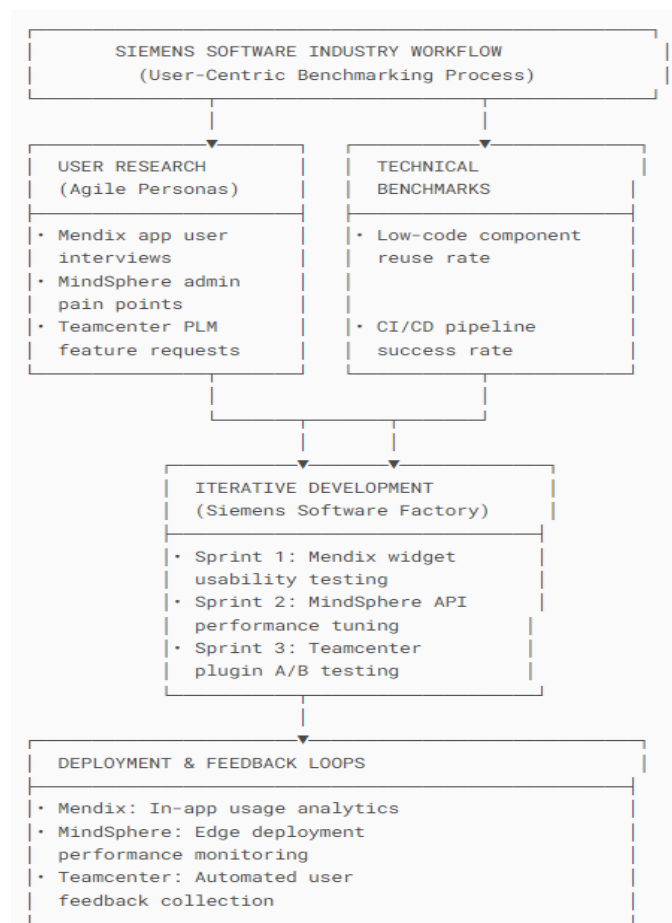
The designs are implemented within an organization to develop effectiveness and efficiency. After the analysis step, developers create and implement an action plan. Implementation is the final step in the benchmarking process <sup>[1]</sup>. In the case of Siemens, they follow the workflow to ensure a measurable benchmarking practice. **Figure 5** outlines Siemens' user-centric benchmarking workflow for industrial software development, which begins by gathering user feedback and setting technical benchmarks for Mendix, MindSphere, and Teamcenter. It then progresses through agile sprints—testing Mendix, optimizing MindSphere APIs, and validating Teamcenter

plugins—before deploying solutions with real-time monitoring (in-app analytics, edge performance tracking, and automated feedback). The process ensures continuous improvement by aligning development with user needs and measurable performance standards <sup>[2]</sup>.

### Phases in IT benchmarks



**Figure 4.** Systematic benchmarking progression



**Figure 5.** User-centric benchmarking workflow

## 5. Conclusion

This paper introduces benchmarking as a strategic tool for motivating industrial digital transformation. In this industrial era, benchmarking enables organizations to identify performance gaps, adopt best practices, and accelerate innovation <sup>[9]</sup>. The literature review examines how leading enterprises leverage benchmarking to achieve competitive advantages in automation, the Internet of Things (IoT), and AI-driven solutions, which are central to Siemens' digital transformation strategy. The paper then focuses on Siemens' proprietary benchmarking framework, which supports the development of cutting-edge industrial applications. This framework begins with rigorous goal identification, where teams define and prioritize objectives aligned with Siemens' innovation roadmap. These may include enhancing interoperability in automation systems, improving predictive maintenance capabilities, or optimizing human-machine interfaces. A preliminary gap analysis follows, ensuring the goals address technical feasibility and market demands across Siemens' industrial domains. Data collection forms the foundation of Siemens' benchmarking methodology. Teams systematically identify critical data requirements for specific applications. For instance, when developing a digital health solution, this process captures medical device interoperability standards, real-time diagnostics protocols, and compliance requirements <sup>[8]</sup>. These benchmarks are compared against existing Siemens solutions (e.g., Teamcenter for product lifecycle management) and competitor offerings to establish performance baselines. The target selection phase employs a structured approach to evaluate best-in-class industrial applications. Siemens teams analyse platforms like MindSphere (an Internet of Things-based system) and Mendix (low-code development) across key metrics, including system reliability, integration capabilities, and user adoption rates. This comparative analysis informs strategic decisions about which features and architectures Siemens should emulate or surpass in its solutions. Finally, the methodology culminates in design and implementation. Insights from benchmarking are translated into actionable plans for Siemens' Xcelerator portfolio, with particular attention to industrial-grade principles that balance functionality with operator needs; secure interface development following IEC 62443 standards; and seamless integration with existing systems. By institutionalizing this benchmarking approach, Siemens maintains its leadership in industrial innovation while delivering solutions that set new standards for digital transformation <sup>[13]</sup>. The methodology identifies performance gaps and provides a clear pathway for developing superior industrial applications that meet evolving market demands. Contemporary research demonstrates how industrial leaders leverage benchmarking across multiple dimensions. For capital-intensive industries where Siemens operates, benchmarking provides insights into the technology maturity of automation components and the effective implementation efficiency of innovative factory solutions. Academic studies particularly highlight the growing importance of cross-industry benchmarking, where best practices from sectors like automotive or aerospace inform innovation in healthcare technology or energy systems—a strategy Siemens actively employs through its diverse portfolio <sup>[11]</sup>.

## 6. Limitations

The methodology presented here will serve as a bridge between today's fragmented innovations and tomorrow's ecosystem of standardized, reusable solutions. However, several areas warrant further investigation to enhance its applicability. Two key limitations of this study are present opportunities for future research: First, the methodology remains primarily descriptive and would benefit from a more prescriptive, actionable framework. Second, the current approaches for target selection and priority computation require refinement to better align with industrial-scale decision-making. Additionally, the existing method focuses on customer-facing front-end

aspects of digital applications. Extending this to internal infrastructure—such as industrial hardware, network administration systems, and enterprise-level operational technologies—poses a greater challenge. Addressing this would necessitate a collaborative benchmarking approach that leverages cross-domain expertise within Siemens' ecosystem.

## Disclosure statement

The author declares no conflict of interest.

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# Reconstructing Science Learning through Multidimensional Project-Based Pedagogy: A STEAM-Integrated Crystal Exploration in Chinese Elementary Schools

Yamin Wang<sup>1\*</sup>, Dongjin Li<sup>2</sup>, Yiyi Li<sup>3</sup>

<sup>1</sup>School of Primary Education, Changsha Normal University, Changsha, Hunan, China

<sup>2</sup>School of Primary Education, Qiongtai Normal University, Haikou, Hainan, China

<sup>3</sup>Hengshan County Kaiyun Township Central School, Hengyang, Hunan, China

*\*Corresponding author: Yamin Wang, wangyamin@csnu.edu.cn*

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**Abstract:** Based on the project-based learning design framework, this paper designs specific project-based activities for sixth-grade elementary school students in conjunction with the elementary school science course “Crystals under the Magnifying Glass.” The activities included searching for crystals around them, observing crystals using a microscope, making artificial crystals, crystal knowledge sharing session, crystal artwork creation, and exploring the conditions of crystal growth, aiming to deepen the students’ understanding of crystal knowledge as well as to cultivate their scientific thinking, inquiry practice, and teamwork skills through exploratory, technological, creative, social, aesthetic, and moderated practices. The results showed that the students showed strong interest in the project-based activities, and their learning autonomy, cooperative learning ability, and innovation ability were significantly enhanced. However, the organic integration of subject knowledge and project-based activities and the breaking of students’ inherent thinking need to be further strengthened.

**Keywords:** Project-based; Elementary school science curriculum; Activity design and practice

**Online publication:** June 6, 2025

## 1. Introduction

In promoting the development of science education in China, it is necessary to continuously strengthen the construction of science curriculum, improve the quality and level of science curriculum, and lay a solid foundation for cultivating more scientific and technological innovation talents<sup>[1]</sup>. Strengthening the construction of science curriculum and the improvement of its educational quality has become a key goal of science education reform. The elementary school science curriculum advocates an inquiry-based teaching method to cultivate students’ scientific



literacy. This inquiry-based teaching mode and practical science activities can effectively promote students' scientific thinking skills and their overall personal development. Project-based learning serves as an effective means to optimize the teaching methods of elementary school science and achieve curriculum integration <sup>[2]</sup>. Project-based learning refers to the acquisition of focused knowledge and skills by students over a period of time by studying and responding to an authentic, engaging, and complex problem, issue, or challenge <sup>[3]</sup>. It emphasizes the students' subject position and focuses on cultivating their practical ability, innovative thinking, and teamwork spirit. By guiding students throughout the process to participate in all aspects of the selection of project content, collection of information and knowledge, exploration of problematic activities and production of related activities, it forms a comprehensive project model that contains a variety of forms of activities, which has injected a new vitality into elementary school science education.

Project-based learning presents diverse forms of practice. The United States will be technical engineering and scientific inquiry into "science and engineering practice", pay attention to hands-on science activities, emphasizing "do middle school" <sup>[4]</sup>. In the Nordic countries, project-based teaching is widely used in vocational education, focusing on students' performance and attitudes, and the acquisition and application of metacognitive skills <sup>[5]</sup>. In contrast, a study at Seoul National University in South Korea revealed the importance of mutual evaluation among group members in project-based learning, especially the significant impact of peer-to-peer management and collaborative procedures on evaluation results <sup>[6]</sup>. The research on the application of project-based learning in elementary school science mainly focuses on the aspects of instructional design and the merits of activities <sup>[7-9]</sup>. The main features of project-based teaching are that the problems originating from real life are used as the driving force to carry out the activity of inquiry, the formation of a learning community, the form of group cooperation for inquiry learning, and the evaluation methods should be diversified <sup>[7]</sup>. Through the implementation of project-based teaching, it can effectively improve students' mastery of knowledge, behavioral skills development, problem-solving ability, and promote students' cooperation and communication <sup>[8]</sup>. Project-based learning improves children's foundational scientific skills, and project-based learning develops children's spiritual qualities of science <sup>[9]</sup>. China's research on the project-based learning approach in the teaching mode is relatively late, and there are fewer cases related to the theory-guided practice, mainly in physics, geography, biology, and other disciplines, and there are relatively few cases of research on elementary school science.

This paper takes the project-based learning design proposed by Xia Xuemei as a framework, combines the primary science "crystals under the magnifying glass" lesson and the analysis of the situation of elementary school fifth-grade students to design a specific project-based activity plan for elementary school science, and evaluates and analyzes the results of the implementation of the course activities through teaching practice and questionnaires <sup>[10]</sup>. It aims to provide elementary science teachers with case studies of project-based activities and to promote the innovative development of elementary science education.

## 2. Project-based learning design framework

Based on the eight "golden rules" of project-based learning proposed by the Buck Institute for Educational Research, some scholars have proposed six steps of project-based learning design based on the perspective of learning literacy <sup>[10-12]</sup>.

## **2.1. Definition of core knowledge**

Project-based learning design builds project-related basic knowledge and skills based on finding key concepts or competencies with the help of curriculum standards, textbooks, and other materials. While integrating interdisciplinary knowledge, it keeps close to the core of the discipline to ensure the clarity of learning objectives and the depth of content.

## **2.2. Design of driving questions**

Project-based learning triggers students' thinking and exploration of concepts through questions. Teachers should express the core knowledge in the form of questions. These questions need to have the characteristics of enhancing essential understanding, connecting students' experiences, transforming facts into concepts, originating from students, and triggering conflict and controversy. Good driving questions stimulate higher-order thinking and provide a meaningful framework for learning content.

## **2.3. Clarifying higher-order cognitive strategies for projects**

Project-based learning focuses on driving low-value cognition through higher-order cognition. Teachers need to clarify the higher-order cognitive strategies embedded in the driving questions and learning outcomes, so as to promote the integration of basic knowledge and skills through careful design and to realize in-depth learning of conceptual knowledge.

## **2.4. Identify key learning practices**

Depending on the type of program, the characteristics of the driving questions, and the program process, teachers should incorporate appropriate learning practices. Clarifying the basic components of various practices can help design a journey that is more stimulating to students' thinking and learning.

## **2.5. Identify learning outcomes and how they will be disclosed**

Based on the project-driven questions, initially conceptualize the learning outcomes for individual and groups of students, and develop clear and specific evaluation criteria and public presentation methods. The project outcomes should directly reflect the core issues of the discipline, and the assessment criteria should be detailed and comprehensive to ensure that students' mastery of the core knowledge can be accurately measured.

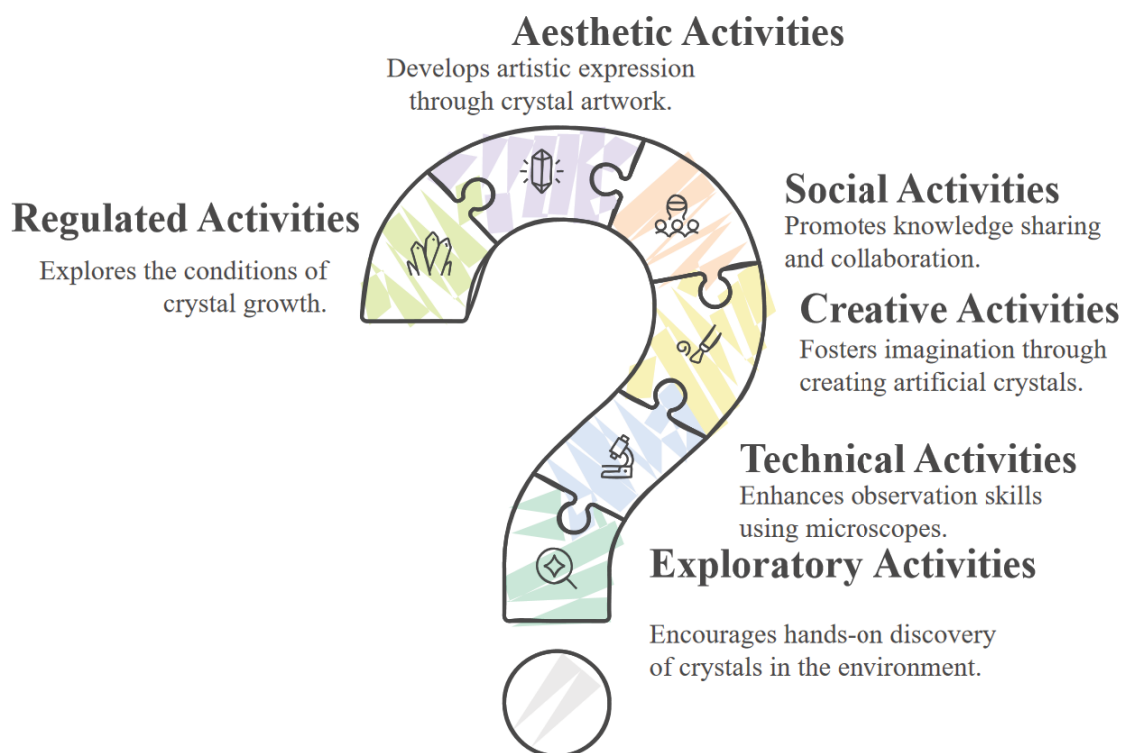
## **2.6. Design evaluation covering the whole process**

Upon completion of the project design, the project outcomes and process evaluation should be refined, including the topic setting and marking arrangement. The evaluation should cover the results and the main practical process of students, reflecting the comprehensive and holistic nature, while encouraging students to participate in the evaluation, and jointly promoting the improvement of learning results and the overall development of students.

## **3. Project-based activity design for “Crystals under the Magnifying Glass”**

Under the framework of project-based learning design, this paper chooses the elementary school science lesson “Crystals under the Magnifying Glass” to carry out project-based activity design (**Figure 1**).





**Figure 1.** Project-based activity design chart for “Crystals under the Magnifying Glass”

### 3.1. Constructing project objectives based on core knowledge

Scientific conception: To recognize mineral crystal holes by collecting knowledge; to make crystals by using different methods, so that students can deepen their understanding of mineral crystal holes and stimulate their scientific interest and innovation potential.

Scientific thinking: To improve students’ communication and collaboration skills through cooperation and discussion among groups and designing activity programs; to cultivate students’ ability to apply knowledge and think logically through searching for information.

Exploration and practice: Through understanding the knowledge of crystals, stimulate students’ autonomy of exploration through this activity; strengthen students’ teamwork, scientific spirit, and improve students’ hands-on creative ability, so that they can truly appreciate the magic of nature.

Attitude responsibility: Initial understanding of science to promote technological progress, students make their own artificial crystals and experience the fun of making mineral crystals. Observe with scientific eyes how the phenomena of nature are related to their lives.

### 3.2. Design Driving Questions

Driving question: What are the unique shapes of ice and snowflakes on the window glass in winter?

Contextualized design: On a winter morning, the teacher guides the students to observe the shape of the ice flowers on the windows, leading them to start an exploration of the beauty of nature. Guide students to think about the difference between snowflakes and ice flakes. Why do snowflakes come in so many shapes? Students are attracted to the wonders of nature’s crystals and become interested in exploring them. Under the guidance of

the teacher, use a magnifying glass or a microscope to observe the shapes of ice flowers and snowflakes and try to understand how they are formed, so as to gain a deeper understanding of the mysteries of the crystal world.

### **3.3. Finding higher-order cognitive strategies for the project**

Analyzing and synthesizing: Students analyze the characteristics of different crystals, the formation process, and synthesize this information to make artificial crystals or draw crystal shapes.

Critical thinking: Students need to use critical thinking to evaluate the reliability of information, the validity of experiments, and the reasonableness of conclusions.

Creative thinking: Students are encouraged to design unique experimental solutions or observations to investigate the mysteries of crystals, as well as to creatively present learning outcomes, such as making models of crystals.

Problem solving: Students need to use problem-solving strategies to solve problems, such as how to observe crystals and how to make crystals.

Cooperative learning: Students develop teamwork and communication skills through group discussion, division of labor, and presentation of results.

### **3.4. Designing Learning Practices**

#### **3.4.1. Exploratory practical activities: Finding crystals around**

Encourage students to look for crystals, such as table salt, sugar cubes, etc., at home or on campus, and use magnifying glasses to observe their shape, color, transparency, and other properties. Through direct observation, students can deepen their understanding of the basic concepts of crystals.

#### **3.4.2. Technical practical activities: Observing crystals using a microscope**

Under the guidance of the teacher, students learn to use microscopes to observe ice flowers, snowflakes or artificially made crystal samples and record the observations. Students develop microscopic observation skills and improve their understanding of the microstructure of crystals.

#### **3.4.3. Creative practical activities: Making artificial crystals**

Students work in groups, choose different methods to make crystals or other types of crystals, and record the process of making them. Through hands-on production, students deepen their understanding of the process of crystal formation and, at the same time, stimulate their creative potential.

#### **3.4.4. Social practical activities: Crystal knowledge sharing session**

Students work in groups to prepare content about crystal knowledge sharing, such as the definition, types, and formation principles of crystals, and share it in class. Students will develop their communication and teamwork skills as well as deepen their understanding of crystal knowledge.

#### **3.4.5. Aesthetic practical activities: Crystal artwork creation**

Students will use the crystals they have made or collected and combine them with other materials to create crystal artworks, such as crystal hanging ornaments and crystal paintings. Cultivate students' aesthetic ability and creativity, and at the same time let them feel the beauty and magic of crystals in practice.

### **3.4.6. Regulated Practical Activities: Exploring the conditions of crystal growth**

Students work in groups to investigate the growth of crystals under different conditions by changing the conditions of temperature, humidity and concentration of solution, and record the experimental results. Students will develop their ability to design experiments and analyze data, as well as deepen their understanding of crystal growth conditions.

### **3.5. Designing public results and evaluation points**

Individual results display: students present their crystal observation diaries, works produced, etc.

Team presentation: The team will present the results of the crystal production workshop, including the production process, work display, and so on.

Evaluation and feedback: Teachers and classmates evaluate their own and other people's works and make suggestions for improvement.

### **3.6. Designing whole-process evaluation**

Process evaluation: To assess students' participation, cooperation, and problem-solving ability during the implementation of the project.

Outcome-based evaluation: To assess students' learning outcomes, including the mastery of crystal knowledge, observation and record-keeping abilities, and the skills of making crystals.

Reflective assessment: To guide students to self-reflection, summarize their learning experience, and clarify the direction of improvement.

Transferability assessment: To assess whether students can apply what they have learned about crystals in real life, as well as their innovative thinking and transferability.

## **4. Project-based activity practice of “Crystals under the Magnifying Glass”**

The sixth-grade students of Hengshan County Kaiyun Township Central School were selected as the target of the survey, and their mastery of science knowledge was relatively good, and they were more interested in hands-on science courses, which well reflected the differences between science and other language and mathematics courses.

### **4.1. Implementation of project-based activities**

#### **4.1.1. Project-based activities**

Teacher preparation: Teachers need to prepare the necessary materials in advance, such as magnifying glasses, microscopes, and chemical reagents needed for crystal making. At the same time, teachers need to familiarize themselves with the project process, design the activity plan, and prepare relevant guiding questions and contextualized design.

Student preparation: Students need to understand the basic requirements and objectives of the project, and prepare notebooks and pens for recording observations and the production process. Meanwhile, students also need to have a basic understanding of crystals, which can be acquired by previewing the textbook or consulting the information.

#### **4.1.2. Activity implementation stage**

Exploratory practice: Teachers guide students to look for crystals at home or in the schoolyard and use magnifying

glasses to observe their shape, color, transparency, and other properties. Students need to record their observations and discuss and exchange them in groups.

Technical practice: Under the guidance of the teacher, students learn to use a microscope to observe crystal samples. Teachers need to teach students the correct way to use the microscope and guide them to observe the microstructure of crystals. Students need to record their observations and analyze and discuss them.

Creative practice: students work in groups to make artificial crystals. Teachers need to provide different methods and materials for students to choose and try out. Students need to record the production process, problems encountered and solutions, and share and exchange them within the group.

Social practice: Students prepare the sharing content of crystal knowledge in groups and share it within the class. Teachers need to arrange the time and place of the sharing session in advance and provide necessary support and assistance. Students need to actively participate in the sharing session, listen attentively to the content shared by other groups, and ask their own questions and suggestions.

Aesthetic practice: Students create crystal artworks using crystals they have made or collected. Teachers need to provide the necessary materials and tools, and guide students to use their imagination and creativity to create their works. Students need to present their works and explain the ideas and process of creation.

Moderated Practice: Students work in groups to investigate the growth of crystals under different conditions. Teachers need to provide guidance on experimental design and data analysis, and guide students to draw conclusions. Students need to record the experimental process, data and analysis results, and discuss and exchange them in their groups.

#### **4.1.3. Activity summarization stage**

Individual results presentation: Students present their individual results, such as their crystal observation diaries and the works they made. Teachers need to evaluate and provide feedback on the students' results and make suggestions for improvement.

Team presentation: The team will present the results of the crystal making workshop, including the production process and the works. Teachers need to evaluate and feedback on the group's results and encourage communication and sharing among the groups.

Reflection and transfer: Teachers guide students to reflect on themselves and summarize their learning experiences and gains. At the same time, teachers need to assess whether students can apply what they have learned about crystals in real life, as well as their innovative thinking and transfer ability. Teachers can design some transferable tasks or problems for students to try to apply what they have learned to new situations.

#### **4.1.4. Activity evaluation and feedback**

Teachers need to evaluate students' participation, cooperation ability, problem-solving ability, and learning outcomes according to the design of whole process evaluation. Teachers also need to assess students' ability to reflect and transfer.

Teachers need to give students timely feedback and suggestions to help them improve their learning and production methods. At the same time, teachers need to encourage mutual evaluation and feedback among students to promote communication and cooperation among them.

## 4.2. Evaluation of the implementation of project-based activities

After the implementation of project-based activities, students' feedback was positive, and their interest in learning increased significantly. 76% of the students indicated that they were very willing to participate in such activities, and 82% liked the project-based activity model, which indicated that the course design was well received by the students and promoted the enhancement of students' learning autonomy. However, 56% of the students thought that continuing learning after class was very compatible, indicating that the guiding role of knowledge needs to be further strengthened in the classroom design, extending learning into students' lives, and reflecting the concept of lifelong learning.

In terms of cooperative learning, 78% of the students were able to communicate well with their classmates, 80% were able to carry out division of labor effectively, and 92% were clear about their group responsibilities. These figures exceeded the expectations, indicating that the design of the project activities effectively enhanced the students' ability to work in groups.

The transfer of knowledge is still weak. Only 58% of the students thought that the integration of knowledge into the study of "crystals" was very suitable. In making crystals, some students ignored their previous knowledge of dissolution in Grade 4 science. 64% of students were able to think about the design options in various ways, but their creativity still needs to be strengthened. More than half of the students were able to choose the optimal solution and adjust the design solution, demonstrating some ability in practical problem solving.

44% of the students were willing to show their work to other groups, and 76% of them could suggest improvements to the work of others, which practiced independent thinking and the ability to integrate knowledge. 76% of the students had a good understanding of "crystals", and 98% of them had mastered the scientific knowledge of the lesson, thus achieving the knowledge-based objectives. Although only 70% of the students were very satisfied with the transfer of knowledge, their ability to transfer knowledge has been strengthened compared with that before the lesson. 82% of the students were able to complete the design of their works on time, practicing their hands-on ability to make and invent, and developing the good habits of thinking independently, thinking quickly, and not procrastinating.

## 5. Conclusion

In this paper, on the basis of integrating the project-based learning design as a framework, combining primary science "crystals under the magnifying glass" to design specific primary science project-based activities, and evaluating the effect of project-based learning through teaching practice. An analysis of the sixth-grade students' learning situation in the pre-activity period revealed that most of the students were able to design experiments according to the teacher's requirements, but their ability to think independently and innovate on their own was relatively weak. After the implementation of the project, students' attitudes towards learning science have changed greatly, and their cooperative learning ability as well as their innovation ability have been very well practiced in the project-based activities. The new learning model based on project-based activities strengthens the cultivation of students' independent learning ability, so that students can quickly experience integration and utilization of multiple disciplines in the activities, and the transfer of knowledge is strengthened.

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# Comparative and Innovative Application Research of Machine Learning Algorithms in User Churn Prediction

Qiuyue Chen\*

Guangzhou Huanan Business College, Guangzhou 510550, Guangdong, China

*\*Author to whom correspondence should be addressed.*

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**Abstract:** Customer churn has a significant impact on enterprises as it directly affects their revenue and profit. This paper focuses on analyzing user behavior data based on a machine learning-based user churn prediction model, constructs a prediction model, and verifies its effectiveness. This aims to help enterprises better understand user behavior and prevent user churn in advance. Meanwhile, by collecting and analyzing user data, multiple machine learning algorithms are used for modeling and evaluation to determine the optimal prediction model, which is then applied to practical business scenarios. The experimental results show that the model can accurately predict user churn, providing strong support for enterprises to develop personalized marketing strategies and enhancing user retention rates and enterprise competitiveness.

**Keywords:** Machine learning; User churn; Prediction model; Behavior analysis; Random forest

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## 1. Introduction

With the transformation of the industrial structure, the market environment is becoming increasingly severe, forcing enterprises to face the serious problem of user churn. User churn not only affects the economic benefits of enterprises but may also lead to negative word-of-mouth, influencing the enterprise's brand image and market competitiveness. Traditional user churn prediction methods have problems such as low prediction accuracy and inability to handle large-scale data <sup>[1]</sup>. However, the development of machine learning technology provides new ideas and methods to solve this problem. With the development of information technology, the application of machine learning in user churn prediction models is becoming more and more widespread. Machine learning algorithms can efficiently process large-scale datasets, extract valuable patterns and rules from them. At the same time, through training and optimizing the model, machine learning algorithms can more accurately predict the risk of user churn, providing a more reliable decision-making basis for enterprises <sup>[2]</sup>.

## 2. Relevant theories and technical foundations

### 2.1. Definition and influencing factors of user churn

User churn refers to the behavior of users stopping using a product or service and no longer interacting with or making purchases. There are many reasons for user churn, including poor product experience, inadequate service, fierce competition, lack of personalized service, and individual customer factors. Product quality is the basis for customer selection and retention. If a product has frequent problems, customers' trust will quickly collapse, and they will share negative experiences through various channels, affecting the purchase decisions of other potential customers. Analyzing the reasons can help effectively understand the key factors of user churn and provide a basis for subsequent model construction <sup>[3]</sup>.

### 2.2. Overview of machine learning algorithms

**Logistic regression:** Logistic regression is a statistical method used to model the relationship between independent variables and a binary-classified dependent variable. Its core is to estimate parameters through maximum likelihood and output the probability value of an event occurring <sup>[4]</sup>. Logistic regression has a certain degree of interpretability, and the direction and intensity of the learning algorithm can be explained through specific symbols and data.

**Decision tree:** A decision tree is a classification algorithm based on a tree structure. It constructs a decision tree by dividing the dataset. The decision-tree model is easy to understand and interpret, and can handle non-linear data. However, it is sensitive to data changes and is prone to overfitting <sup>[5]</sup>.

**Random forest:** As a machine learning algorithm, the core concept of the random forest lies in “collective wisdom”, that is, combining the prediction results of multiple individual decision-tree models to achieve more accurate and robust classification or regression tasks. The random forest performs well in handling high-dimensional and non-linear data and has a high ability to resist overfitting <sup>[6]</sup>.

**Gradient boosting decision tree (GBDT):** It is mainly used to solve regression and classification problems. Its core idea is to iteratively improve the model step by step. Each iteration corrects the errors of the previous-round model, gradually reducing the prediction error. Each weak classifier fits the residuals of the previous round, gradually reducing the value of the loss function. GBDT can automatically handle the non-linear relationships between features and has strong prediction ability and generalization performance.

### 2.3. Evaluation metrics

**Accuracy:** It is a concept widely used in scientific experiments, data analysis, and machine learning. Its core meaning is to measure correctness. The formula is:  $Accuracy = \frac{TP+TN}{TP+TN+FP+FN}$ , where TP represents true positives, TN represents true negatives, FP represents false positives, and FN represents false negatives.

**Precision:** Precision is one of the important indicators for evaluating the performance of a classification model. It represents the proportion of true positives in the prediction results of the classification model. The formula is:  $precision = \frac{TP}{TP+FP}$

**Recall:** Recall is an important indicator for evaluating the performance of a model or system. It is usually used to measure the proportion of samples that are actually positive and are correctly identified as positive. The



formula is:  $F1 = \frac{2 \times Precision \times Recall}{Precision + Recall}$

F1-Score: The F1-score is the harmonic mean of precision and recall. The formula is:

$$F1 = \frac{2 \times Precision \times Recall}{Precision + Recall}$$

The F1-score aims to balance the relationship between precision and recall <sup>[7]</sup>.

## 2.4. Data collection and preprocessing

### 2.4.1. Data source

This study uses the user data of an e-commerce platform, including users' basic information (such as age, gender, region, etc.), transaction records (such as purchase amount, purchase frequency, category of purchased goods, etc.), browsing behavior (such as number of views, browsing duration, browsed pages, etc.), and user feedback (such as evaluation scores, number of complaints, etc.) <sup>[8]</sup>. The data covers the user activity information over a certain period in the past, and a total of 10,000 pieces of user data were collected <sup>[9]</sup>.

### 2.4.2. Data cleaning

Removing duplicate data: By checking for duplicate records in the dataset, duplicate user data is deleted to ensure the uniqueness of each piece of data.

Handling missing values: For features with missing values, an appropriate filling method is selected according to their data type and distribution. For categorical features, the mode can be used for filling. For example, for the age feature of users, if there are missing values, the mean value of that age group can be used for filling <sup>[10]</sup>.

Handling outliers: Identify and handle outliers in the data to avoid their negative impact on model training. For example, for the purchase-amount feature of users, if a user's purchase amount is much higher than that of other users, it may be abnormal data and needs further verification and processing <sup>[11]</sup>.

### 2.4.3. Data preprocessing

Raw data usually contains noise, missing values, etc., and needs to be preprocessed <sup>[12]</sup>.

### 2.4.4. Feature engineering

Feature engineering is a key step in machine learning, aiming to transform raw data into features more suitable for model use. By analyzing user behavior data, features related to user churn, such as activity level, consumption amount, and login frequency, are extracted <sup>[13]</sup>.

Feature selection: Feature selection methods, such as correlation analysis and chi-square test, are used to screen out feature variables related to user churn. For example, calculate the chi-square value or correlation coefficient between each feature and the user-churn label, and select features with larger chi-square values or correlation coefficients as important features.

Feature transformation: Some features are transformed to meet the input requirements of the model or improve the model's performance. For example, numerical features are standardized so that their mean is 0 and their standard deviation is 1 <sup>[14]</sup>.

### 3. Model construction and training

#### 3.1. Model selection

This paper selects the random forest as the basic model because of its good classification performance and anti-overfitting ability.

#### 3.2. Model formula

Let  $X = (x_1, x_2, \dots)$  be the feature vector, and  $y$  be the target variable (churn or not, churn is 1, no churn is 0). Then the model can be expressed as:  $y = f(X) = \text{RandomForest}(X)$ , where  $\text{RandomForest}(X)$  represents the prediction result of the random-forest model for the feature vector  $X$ .

The random forest is composed of multiple decision trees, and the final prediction result is determined by voting on the prediction results of each decision tree. The prediction formula for a single decision tree is:  $y_i = g(m_i; \theta_i)$  where  $y_i$  represents the prediction result of the  $i$ -th decision tree,  $g$  represents the decision-tree model, and  $\theta_i$  represents the parameters of the  $i$ -th decision tree.

The final prediction result of the random forest is:  $\hat{y} = \frac{1}{N} \sum_{i=1}^N y_i$  where  $N$  represents the number of decision trees in the forest.

#### 3.3. Model training and validation

The training dataset is used to train the random-forest model, and the model performance is optimized by adjusting model parameters (such as the number of decision trees, tree depth, etc.)<sup>[15]</sup>.

#### 3.4. Logistic regression model

##### 3.4.1. Model building

Let  $x$  be the feature vector of the user, and  $y$  be the user-churn label ( $y=1$ ) indicates user churn, ( $y=0$ ) indicates no user churn. The form of the logistic regression model is:

$$p(y=1|X) = \frac{1}{1 + e^{-(w^T X + b)}}$$

where  $w$  is the weight vector and  $b$  is the bias term. The parameters  $w$  and  $b$  of the model are solved by maximizing the likelihood estimation (MLE).

##### 3.4.2. Model training

The preprocessed data is divided into a training set and a test set with a ratio of 8:2. The training set is used to train the logistic regression model, and the gradient-descent method is used to optimize the model parameters. During the training process, the value of the loss function (such as the log-likelihood loss function) of the model is recorded. When the loss-function value converges or reaches the preset number of training rounds, the training stops.

##### 3.4.3. Model evaluation

The trained model is evaluated using the test set, and indicators such as accuracy, precision, recall, and F1-score are calculated. The evaluation results of the logistic regression model on the test set are shown in **Table 1**.

**Table 1.** The evaluation results of the logistic regression model on the test set

Index	Value
Accuracy	0.75
Precision	0.68
Recall	0.72
F1-Score	0.70

### 3.5. Decision-tree model

#### 3.5.1. Model building

The decision-tree model selects the best splitting feature and splitting point by calculating the information gain or Gini index of each feature and constructs a binary tree. Common decision-tree algorithms include ID3, C4.5, and CART. In this study, the CART algorithm is used to construct the decision-tree model.

#### 3.5.2. Model training

Similarly, the data is divided into a training set and a test set, and the training set is used to train the decision-tree model. During the training process, parameters such as the maximum depth of the decision tree and the minimum number of samples for splitting are set to prevent the decision tree from growing excessively.

#### 3.5.3. Model evaluation

The model evaluation is shown in **Table 2**.

**Table 2.** Model evaluation

Index	Value
Accuracy	0.78
Precision	0.72
Recall	0.75
F1-Score	0.73

### 3.6. Random-forest model

#### 3.6.1. Model building

The random-forest model is an ensemble-learning model composed of multiple decision trees. When constructing the random-forest model, several sub-sample sets are first randomly drawn from the training set, and a decision tree is constructed for each sub-sample set.

#### 3.6.2. Model training

In machine learning, dividing data into a training set and a test set is a standard practice, which helps to evaluate the generalization ability of the model. As an ensemble-learning method, the random forest improves the accuracy and stability of the model by constructing multiple decision trees. Its core idea is to introduce the randomness of samples and features to avoid overfitting and improve the generalization ability of the model.

#### 3.6.3. Model evaluation

The model evaluation is shown in **Table 3**.

**Table 3.** Model evaluation

Index	Value
Accuracy	0.82
Precision	0.76
Recall	0.79
F1-Score	0.77

### 3.7. Gradient-boosting decision-tree model

#### 3.7.1. Model building

The gradient-boosting decision-tree model iteratively constructs multiple weak classifiers (decision trees), and each weak classifier fits the residuals of the previous round. In this study, the mean-squared-error loss function is used to construct the gradient-boosting decision-tree model.

#### 3.7.2. Model training

The data is divided into two different samples. To ensure that the test set can objectively reflect the performance of the model in practical applications and avoid overfitting problems caused by data overlap. Parameters of the gradient-boosting decision-tree, such as the learning rate, maximum depth, and number of iterations, are set. During the training process, the loss-function value and validation error of the model are monitored to prevent overfitting.

#### 3.7.3. Model evaluation

The model evaluation is shown in **Table 4**.

**Table 4.** Model evaluation

Index	Value
Accuracy	0.85
Precision	0.80
Recall	0.83
F1-Score	0.82

## 4. Experimental results and analysis

### 4.1. Experimental results

Dataset: An online-education-platform user-behavior dataset containing features such as user activity level, consumption amount, and login frequency is used for the experiment.

Experimental results: The accuracy of the model on the validation dataset.

### 4.2. Model performance comparison

By comparing the evaluation indicators of the four models of logistic regression, decision tree, random forest, and gradient-boosting decision tree on the test set, it can be seen that the gradient-boosting decision tree model performs well in terms of accuracy, precision, recall, and F1-score, outperforming the other three models. This indicates that the gradient-boosting decision-tree model has strong performance and generalization ability in

handling user-churn prediction problems.

### **4.3. Analysis of model advantages and disadvantages**

Logistic regression model: The advantages are that the model is simple, easy to understand and interpret, and has a fast calculation speed. The disadvantage is that it has strict assumptions about the data, can only handle linearly separable problems, and has limited ability to handle complex non-linear relationships.

Decision-tree model: The advantages are that it can handle non-linear and high-dimensional data, and the model has strong interpretability. The disadvantages are that it is prone to overfitting, especially when the data dimension is high or the data volume is small. Also, the stability of the decision tree is poor, and its model structure may vary depending on different data-splitting methods.

Random-forest model: The advantages are high accuracy and stability, the ability to handle high-dimensional and non-linear data, and strong anti-overfitting ability. The disadvantages are that the model training time is long, it requires a large amount of computing resources, and the interpretability of the model is relatively poor.

Gradient-boosting decision-tree model: The advantages are high prediction accuracy, the ability to automatically handle complex relationships between features, and strong generalization ability. The disadvantages are that the training process is relatively complex, it requires adjusting more parameters, and it is prone to overfitting.

## **5. Model application and practice**

### **5.1. User-churn prediction**

The trained gradient-boosting decision-tree model is applied to practical business scenarios to predict new user data. According to the prediction results of the model, the user groups that are likely to churn are identified, and corresponding marketing strategies are adopted to retain them. For example, for users predicted to be likely to churn, personalized coupons can be pushed to them, suitable products can be recommended, or better customer service can be provided.

### **5.2. Formulation of personalized marketing strategies**

Based on the user-churn probability predicted by the model and the user's characteristic information, personalized marketing strategies are developed. For example, for young female users with a high churn probability, promotional activities for fashion and beauty products can be pushed according to their interests and consumption habits. For elderly male users with a low churn probability, preferential information for healthcare products can be recommended.

## **6. Conclusion**

In summary, with the continuous development of big-data and artificial-intelligence technologies, user-churn prediction research will play an increasingly important role in enterprise precision marketing and customer-relationship management. By continuously optimizing the model and expanding application scenarios, it is expected to provide more effective decision-making support and solutions for enterprises.

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# Influence of Western Culture on Views of Chinese College Students on Marriage and Childbearing

Guijun Dong<sup>1</sup>, Jiahui Huang<sup>2\*</sup>

<sup>1</sup>College of International Languages and Cultures, Hohai University, Nanjing 210000, China

<sup>2</sup>College of Business, Hohai University, Nanjing 210000, China

*\*Author to whom correspondence should be addressed.*

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**Abstract:** In today's rapidly developing economic globalization, the exchange of views on marriage and childbearing between Eastern and Western cultures is gradually becoming more frequent. The concept of marriage and childbearing in Western culture has changed the thinking of Chinese college students, making their mindset more open, but it also has some adverse effects. This article explores the changes in the views of Chinese university students on marriage and childbearing through the study of Western perspectives, while also connecting them to traditional Chinese culture. A systematic overview of contemporary students' attitudes towards marriage and childbearing is provided, examining both favorable and unfavorable effects. It is conducive to predicting the future trend of marriage and childbirth in China, exploring its underlying reasons, and providing a basis for the formulation of relevant policies.

**Keywords:** Western culture; Chinese college students; Influence; Views on marriage; Views on childbearing

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## 1. Introduction

Students are easily receptive to new things and have a more open-minded mindset. The same is true for contemporary Chinese college students. While exhibiting a blend of traditional Chinese values, they have been somewhat influenced by Western culture in their views on marriage and childbearing.

They value love, freedom, and equality. To achieve self-worth and happiness, some opt to delay marriage and parenthood, while others hastily marry and divorce. "Students are a highly representative group", Li Xinfang pointed out in the paper, that students' views on marriage and childbearing can reflect their commitment and sense of responsibility to their families and society, and to a certain extent, predict the future trends of marriage and family in China <sup>[1]</sup>. Therefore, analyzing their perspectives is critical for anticipating the future development of Chinese society.

## **2. Traditional views on marriage and childbearing in Chinese society**

In traditional Chinese culture, marriage is viewed as the union of two families. People advocate for the concept of “matching families and equal status.” And the wishes of both the man and woman are a secondary consideration. Some conservative Chinese still hesitate when discussing divorce. They believe that divorce is a highly undesirable behavior, especially for women. Many individuals endure unhappiness in marriage, including domestic violence, in order to maintain a complete family for their children.

In terms of fertility, the traditional view is that giving birth is to pass on the family line. There is an ancient Chinese saying that goes, “There are three forms of unfilial conduct, of which the worst is to have no descendants” (不孝有三, 无后为大) (Mencius) <sup>[2]</sup>. This indicates the traditional Confucian concept of filial piety regarding marriage and childbirth.

In traditional Chinese views on marriage and childbirth, there are many positive aspects. Chinese people attach great importance to marriage. They believe that this is a lifelong commitment and should be carefully considered. There were also many love stories in ancient China, such as Liang Zhu (The Butterfly Lovers), Niulang and Zhinu (The Cowherd and the Weaving Maid), and the Legend of the White Snake, all of which reflect the Chinese people’s longing for love. Chinese people value heritage and place great emphasis on the upbringing and education of their children, which is beneficial for their healthy development.

## **3. Views on marriage and childbearing in modern Western society**

In Western society, marriage and childbearing are individuals’ free choices that are not influenced by external factors. Westerners worship Christianity, which values people-centeredness and the pursuit of freedom.

Their view on marriage is based on love, emphasizing the compatibility of both parties in terms of soul and personality, regardless of social status, age, gender, and other factors. Within marriage, spouses are expected to respect each other, communicate effectively, maintain equality, and share rights and responsibilities.

Meanwhile, divorce is a very common thing in Western society. People believe that divorce is also a form of freedom. Once a marriage loses love, or an unsuitable marriage lowers one’s standard of living, divorce is inevitable.

In terms of fertility, Westerners view children as the product of love, rather than solely as heirs. Due to the continuous improvement of pension systems, people do not rely on children to ensure their later years of life. Rather, they are more willing to follow their own wishes.

In addition, the phenomenon of DINK (Double Income, No Kids) is also common, where individuals often choose to have children based on their own desires rather than being influenced by family or other factors. These people often do not like children or have no desire to have children for various reasons. In their view, there are many things that are more important than having children, and spending a lot of time on children is not worth it. So, they do not consider giving birth as a mission in life. They are more inclined to enjoy their own lives.

## **4. The influence of Western marriage and childbearing views on Chinese students**

### **4.1. Positive influence of Western marriage and childbearing views on Chinese students**

To some extent, the Western views on marriage and childbearing have positively influenced Chinese students, inspiring them to seek freedom, equality, and love bravely.

Under the influence of Western culture, Chinese students now pursue their own freedom and happiness more

in marriage. In marital relationships, both spouses have a more equal status and share the same responsibilities <sup>[3]</sup>. At the same time, students are no longer confined to traditional marriage models, but are starting to explore forms of marriage that better suit their own preferences.

Today's young people in China tend to constantly examine the rationality of gender roles within families and pursue gender equality in marriage. In dealing with family affairs, both spouses communicate with each other and make joint decisions.

Cohabitation before marriage has also been gradually accepted, which young lovers believe would allow them to detect the other person's habits in advance, and then the two can work together to see if further development is possible.

The attitude of Chinese students towards divorce has also undergone significant changes nowadays. They believe that if the marriage is not happy, then divorce is necessary. They do not need to maintain an unhappy marriage because of other people's strange looks. And there is no need to compromise for the sake of the children's physical and mental health.

In terms of childbearing, influenced by Western culture, Chinese college students are more inclined to follow their inner desires. They repeatedly weigh the benefits and costs of childbirth, pondering whether it is necessary to have children.

"Highly educated young people are influenced by modern fertility culture and have more independence and autonomy in fertility issues. They consider various factors comprehensively and take a longer-term perspective on reproduction", to quote Hong Xiumin and Zhu Wenting <sup>[4]</sup>. That is to say, college students will not conceive children out of a momentary impulse. They will carefully consider their own wishes and financial situation to decide whether or not to have children and when. This is a positive trend that encourages young people to take responsibility.

## **4.2. Negative influence of Western marriage and childbearing views on Chinese students**

The Western concept of marriage and childbearing has also had a negative impact on Chinese university students, leading to a lack of responsibility and a lack of serious attitudes towards marriage. It has also led to a continuous decline in China's fertility rate, resulting in some social problems <sup>[5]</sup>. The negative impact of Western culture on the marriage views of Chinese university students has also led to some moral issues and corrupted the social values.

In Western culture, marriage is all about emotions, and divorce is not an unforgivable thing. Influenced by Western beliefs, to some extent, some young people may impulsively get married or divorced without serious consideration. They establish a marital relationship without a certain amount of interaction. And once they discover that the husband or the wife is different from what they expected, they immediately seek divorce. Out of emotional control, a momentary impulse can lead to flash marriages and divorces. Such a phenomenon goes against the traditional Chinese culture, where marriage is a very important thing that needs to be carefully considered.

In the West, the pursuit of love may become an excuse for infidelity within marriage. However, in China, infidelity is a very shameful thing, and both spouses have an obligation to be faithful. Everyone has the right to pursue true love, but this must be based on not violating marital obligations. Maintaining mental or physical contact with a third person in a marital relationship should be condemned. "Marriage is a social relationship, a gender relationship with a contractual spirit. Both parties in marriage should follow the moral principles in marriage." <sup>[6]</sup>. However, affected by Western culture, some young people may blur the boundaries between pursuing true love and infidelity, leading to confusion in male-female relationships.

Chaotic relationships between men and women are not conducive to physical health and can lead to the spread of infectious diseases. From a societal perspective, this can lead to the deterioration of social morality.

Similar to the low fertility rate in the West, China's fertility rate has also been decreasing year by year. Chinese students are influenced by Western culture, resulting in lower fertility desires.

They believe that the arrival of children will increase the burden on the family, lower their own living standards, and the effort will outweigh the reward. "The soaring cost of population reproduction has dampened the enthusiasm of the vast majority of families to have children", as is quoted in the article called "The 'Fear of Childbirth' Mentality and Reproductive Views of Contemporary Youth"<sup>[7]</sup>. If it were not for their love of children, they would see no need to have them.

## 5. Conclusion

The authors encourage students to pursue freedom and love. But Rights and obligations are relative. As members of society, when people enjoy the convenience provided by the country and society, people also have an obligation to fulfill their social responsibilities. It is everyone's duty to have children and maintain the sustainable development of society. Similarly, as husbands or wives, they also have an obligation to fulfill their duty of loyalty. In a word, college students should distinguish right from wrong and resist the negative aspects of Western marital views.

In addition, the school should provide moral and ethical education to students, enhancing their sense of morality and responsibility. The government needs to encourage young people to have children through measures such as providing childbirth subsidies, promoting gender equality, and improving the parenting environment.

## Disclosure statement

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# The Integration Scheme Design of Ideological and Political Elements of the Experiential Entrepreneurship Course

Shihong Wei\*

School of Business, Hechi University, Hechi 546300, Guangxi, China

*\*Author to whom correspondence should be addressed.*

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**Abstract:** As experiential entrepreneurship education plays an increasingly important role in the entrepreneurship education system of colleges and universities, the ideological and political education function in experiential entrepreneurship courses has also attracted wide attention from entrepreneurship educators. This paper first sorts out the basic ideas and objectives of ideological and political education in experiential entrepreneurship courses, and then takes four typical experiential entrepreneurship course project consulting courses, enterprise management courses, entrepreneur forums and entrepreneurship reflection courses as examples to excavate ideological and political elements around the characteristics of these courses, design specific ideological and political education content, and analyze the effect of ideological and political education. The design of the integration of the above-mentioned ideological and political elements of the curriculum is of great significance for students to improve their entrepreneurial skills and establish a scientific concept of entrepreneurship.

**Keywords:** Entrepreneurship education; Experiential learning; Ideological and political elements

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## 1. Introduction

In the practice of entrepreneurship education, experiential entrepreneurship courses have been paid more and more attention by colleges and universities. Taking the author's school as an example, experiential entrepreneurship courses include project consulting courses, business management courses, entrepreneur forums, and entrepreneurship reflection courses. Compared with theoretical teaching courses, experiential entrepreneurship courses pay more attention to the practicality and participation of courses, and students' personal experience will help them gain a deeper understanding of entrepreneurial theory and practical skills.

Relevant research has conducted a systematic study on the relationship between entrepreneurship education and curriculum ideological and political education. In terms of the relationship between the two, the innovation



and entrepreneurship education curriculum is consistent and complementary with the curriculum ideological and political education in terms of educational objectives, content, and educational methods <sup>[1-2]</sup>. Through the integration of “thinking” and “creation”, it helps college students entrepreneurs to complete their entrepreneurial dreams while establishing their ambitions to serve the country and promote national development and social progress <sup>[3]</sup>. The deep integration of ideological and political education and college students’ innovation and entrepreneurship education is of great significance for students to establish a correct outlook on life, world outlook, and values <sup>[4]</sup>. In the ideological and political model of experiential entrepreneurship courses, the “practical experience” education model helps to integrate the positive development and innovation spirit into the students’ ideological and moral improvement, to comprehensively improve the students’ innovative and entrepreneurial quality <sup>[5]</sup>. In terms of the problems existing in the integration of entrepreneurship education and curriculum ideological and political education, the teaching content of innovation and entrepreneurship education in colleges and universities at this stage focuses more on book knowledge and theoretical application, the exploration of curriculum ideological and political elements is not enough, the deep ideological and political implication contained in innovation and entrepreneurship education is ignored, and there is a dilemma of shallow integration and difficult integration of curriculum ideological and political content <sup>[6]</sup>.

Based on this, this paper attempts to take the experiential entrepreneurship course as the starting point, effectively integrate ideological and political elements into the entrepreneurship education courses such as project consulting course, enterprise management course, entrepreneur forum and entrepreneurship reflection course, open up more updated ideological and political perspectives, design the ideological and political content of the course, and further improve the ideological and political education in entrepreneurship education in colleges and universities.

## **2. Experiential entrepreneurship course ideological and political education goal**

The integration of ideological and political elements into the classroom of entrepreneurship education is to integrate the concept of moral education into the whole process of entrepreneurship education. For example, the establishment of enterprises needs to master legal knowledge such as company law and contract law to strengthen students’ awareness of the rule of law; the study of the government’s entrepreneurship support policy has enhanced students’ patriotism and national pride; the study of business ethics cultivates students’ moral quality, moral sentiment and social responsibility; the study of management decision-making shapes students’ scientific spirit and exploration spirit. At the same time, experiential entrepreneurship courses allow students to have the opportunity to directly participate in various entrepreneurial activities, such as face-to-face communication with outstanding entrepreneurs, learning typical case studies, understanding and practicing the spirit of great power craftsmen, etc., so that students can have a deeper understanding of the entrepreneurial spirit that embodies the core values of socialism, such as honesty and law-abiding, social responsibility, and courage to innovate. Therefore, experiential entrepreneurship courses can more effectively achieve the goal of ideological and political education in entrepreneurship education.

## **3. Experiential entrepreneurship course ideological and political education content**

### **3.1. Project consulting course**

The project consulting class is an experiential course developed and designed by the entrepreneurial tutor according to the consulting project he undertakes. The students follow the tutor to participate in the whole process



of the project, analyze and solve various problems in the project, and participate in providing the final solution for the customer. Integrating ideological and political education into project consulting courses is helpful to cultivate students' professional ethics, social responsibility, and national feelings. The ideological and political points of the project consulting course are shown in **Table 1**.

**Table 1.** Ideological and political content design of the project consulting course

<b>Ideological and political perspective</b>	<b>Specific content</b>	<b>Professional ethics and integrity</b>
Honesty is the foundation	Honesty is the foundation	Emphasize the importance of integrity in project consulting and abide by professional ethics.
	Consciousness of responsibility	Cultivate students' sense of responsibility to customers, teams, and society, and ensure the feasibility and fairness of consulting suggestions.
community responsibility	Sustainable development	In the consultation, the impact of the project on the environment is considered, and the concept of sustainable development is advocated.
	Social contribution	Encourage students to solve social problems through consulting projects and promote social progress.
Teamwork and Leadership	Collective spirits	Emphasize the importance of teamwork and cultivate collaboration capabilities.
	Leadership training	Through project practice, improve students' leadership and decision-making ability.
Law-abiding and compliant	Innovative consciousness	Encourage students to propose innovative solutions in consulting and promote industry progress.
	Critical thinking	To cultivate students' ability of independent thinking and questioning, and to ensure the scientific nature of consulting suggestions.
Law-abiding and compliant	Law-abiding consciousness	Ensure that consulting projects comply with laws and regulations and safeguard the interests of customers and society.
	Compliance operations	Comply with industry standards and ensure the legal compliance of the consulting process.
Service consciousness and communication ability	Service consciousness	Always put the interests of customers first and provide high-quality services.
	Communication ability	Train students to communicate effectively with customers to ensure accurate understanding of their needs.
Lifelong learning	Continuous learning	Encourage students to keep up with new knowledge, new technologies, and adapt to the changing industry.
	Self-enhancement	Through reflection and summary, improve professional ability and professional quality.

Teachers lead students to participate in real project consulting activities, and consciously integrate ideological and political elements such as quality awareness, service awareness, and professional ethics into all aspects of the project, so that students can experience the importance of ideological and political elements in project practice. This can not only improve students' professional ability, but also enhance their sense of social responsibility and national feelings, and cultivate qualified talents with all-round development.

### 3.2. Business management course

The enterprise management course is developed and designed by the off-campus entrepreneurship tutor according to the actual problems of the enterprise, and the actual cases of the enterprise are brought into the classroom. The students are required to analyze the cases in depth as management consultants, and the tutors evaluate and

guide them. Incorporating ideological and political education into the course of enterprise management helps to cultivate students' professional awareness, integrity management, professional ethics, and national feelings, while improving their management ability and strategic thinking. The ideological and political points of enterprise management courses are shown in **Table 2**.

In the experiential entrepreneurship course, the enterprise management course has the characteristics of high experience and strong practicality. Teachers let students experience the practical significance of ideological and political points in practice by means of simulated operation, enterprise visits, and so on. Integrate relevant ideological and political elements to help students understand the importance of honest management, social benefits, serving national strategies, technological power, and high-quality development. While improving students' professional ability, they can also cultivate their sense of social responsibility and the feelings of rejuvenating the country through industry.

**Table 2.** Ideological and political content design of the enterprise management course

Ideological and political perspective	Specific content	Professional ethics and integrity
Honest management and compliance with laws and regulations	Honest operation	Emphasize that integrity is the cornerstone of business operations, to avoid the provision of shoddy products or services and financial fraud, and other immoral behavior.
	Hold the bottom line	The enterprise management should adhere to the legal and moral bottom line, abide by laws and regulations, maintain market order, and establish a good corporate image.
	Fair competition	Advocate fair competition, against monopoly and unfair competition.
Community responsibility	Sustainable development	Integrate the concept of sustainable development into enterprise management, and advocate green economy and circular economy.
	Social benefit	Enterprises should not only pursue profits, but also pay attention to social benefits, such as environmental protection, employee welfare, and employment.
Feelings of home and country, and mission responsibility	Serve the national strategy	Combine business operations with national strategies, such as “common prosperity”, “rural revitalization”, and “Belt and Road” to enhance students' sense of mission.
	Socialist core values	Integrate socialist core values into corporate culture, guide the development of enterprises with excellent corporate culture, and establish correct value orientation in production and operation.
	The pursuit of scientific and technological innovation	Encourage students to pay attention to core technology research and development, promote enterprise innovation, and help build a national science and technology power.
Centre people management idea	Spirit of entrepreneurship	The spirit of innovation, risk-taking, cooperation, and responsibility is emphasized in the business, and students are encouraged to be brave in the future business.
	employee care	It is emphasized that enterprises should pay attention to employee growth, welfare, and mental health, and build harmonious labor relations.
Innovation drives high-quality development	Science and technology power	He emphasized the Party Central Committee's assertion that “Chinese-style modernization depends on the modernization of science and technology”, and encouraged students to focus on technological innovation, management innovation, and business model innovation in business operations.
	High-quality development	When guiding students to pay attention to future entrepreneurship, they should pay attention to the long-term development of enterprises. While pursuing the increase in quantity, they should pay more attention to the improvement of the “quality” of enterprises.
	Digital transformation	Guide students to understand the national digital strategy, combine the national artificial intelligence industry development plan, and promote the intelligent and digital transformation of enterprises.

### 3.3. Entrepreneurs forum

The Entrepreneur Forum course invites entrepreneurs to enter the entrepreneurship classroom and communicate with students face-to-face about their entrepreneurial history, development history, and business gains and losses. It is not only conducive to students' learning entrepreneurial skills, but also stimulates students' entrepreneurial enthusiasm. Integrating ideological and political education into the entrepreneur forum course can help students establish a correct business outlook, a sense of social responsibility, and a sense of serving the country. The entrepreneur forum course ideological and political points are shown in **Table 3**.

**Table 3.** Entrepreneur forum course ideological and political content design

Ideological and political perspective	Specific content	Professional ethics and integrity
Entrepreneurship and mission	Spirit of entrepreneurship	Carry forward the spirit of innovation, adventure, cooperation, and responsibility of entrepreneurs, and encourage students to practice entrepreneurship in entrepreneurship.
	Mission and responsibility	It is emphasized that entrepreneurs are not only participants in economic activities, but also promoters of social progress, and should shoulder the responsibilities entrusted by the times.
Social responsibility and sustainable development	Social responsibility	Entrepreneurs should pay attention to the impact of enterprise development on society, such as environmental protection, employee welfare, and charitable donations.
	Sustainable development	Promote green economy, circular economy, and low-carbon economy, and promote the development of enterprises with new productivity.
	Prosperity in common	Through reasonable distribution and public welfare undertakings, we will help achieve the goal of common prosperity.
Global vision and cultural confidence	International outlook	Cultivate entrepreneurs' global thinking, understand international market rules, and enhance the international competitiveness of enterprises.
	Cultural confidence	Respect cultural differences in cross-border operations, while strengthening cultural self-confidence and promoting multicultural integration.
The dominant position of enterprise innovation	Entrepreneurs' innovation consciousness and innovation power	Entrepreneurs are the power source of continuous innovation of enterprises, and the key to increasing innovation investment and enhancing innovation results. The spirit of innovation is conducive to promoting the research and development of core technology of enterprises and helping the construction of a national science and technology power.
	Open cooperation and common progress	It advocates exchanges and cooperation among entrepreneurs to jointly promote industrial technology upgrading and social progress.

The entrepreneur classroom is to guide students' entrepreneurial activities with typical cases by inviting entrepreneurs to enter the entrepreneurship education classroom to share their experiences. Because students have a natural sense of worship and confidence in successful entrepreneurs, when they interact directly in the classroom, the expression of entrepreneurs' ideological and political education views is easier for students to understand, accept, and follow, and the effect of ideological and political education is better. Therefore, the integration of ideological and political elements into this course can not only enhance students' entrepreneurial awareness and entrepreneurial skills, but also give full play to the role of entrepreneurs as an example and encourage students to establish lofty ideals.

### 3.4. Entrepreneurship reflection course

The entrepreneurship reflection class is a stage summary, exchanging experiences, and reflecting discussion of students' entrepreneurship practice in the classroom with entrepreneurship tutors and students. The nature of the course is open teaching. Teachers and students can have an open discussion on the results or problems of entrepreneurial activities in the previous stage. The interactive communication atmosphere is good, which is convenient for teachers to effectively integrate ideological and political elements into the course, cultivate their entrepreneurial spirit, risk aversion consciousness, and lifelong learning concept. The content of the ideological and political points of the entrepreneurship reflection course is shown in **Table 4**.

**Table 4.** Ideological and political content design of the entrepreneurship reflection course

Ideological and political perspective	Specific content	Professional ethics and integrity
Entrepreneurial spirit	The Chinese nation's traditional hard work, the self-improvement spirit of entrepreneurship	Carry forward the spiritual connotation of innovation, adventure, cooperation, and responsibility in the entrepreneurial spirit of the new era, and encourage students to practice the entrepreneurial spirit of excellent entrepreneurs in entrepreneurship.
Lifelong learning constantly improve themselves	Continuous learning	Encourage students to face the era of digital economy and the era of artificial intelligence, constantly update their knowledge, and adapt to the changes of the times.
	Self-reflection, continuous progress	Through reflection and summary, improve the skills and skills of serving the country and giving back to society.
Risk awareness and crisis management	Social responsibility fulfillment and risk prevention, and control	Analyze and cultivate students' ability to identify and respond to entrepreneurial risks with typical positive and negative cases, and guide students to face and solve risks with a high sense of social responsibility, such as market risks, financial risks, and innovation risks.
	Social responsibility fulfillment and crisis management	Through case analysis, students can understand the social responsibility and moral responsibility of enterprises in crisis.

The entrepreneurship reflection course has a relative particularity in the experiential entrepreneurship education course, which is different from the classroom teaching of other courses and the teacher-based situation. This course is open and two-way interactive. The content design of teachers' ideological and political education and the choice of ideological and political education methods are more free and flexible. Integrating ideological and political education into the entrepreneurship reflection course not only helps students summarize entrepreneurial experience and lessons but also cultivates their sense of social responsibility and the concept of lifelong learning. In future entrepreneurial activities, students can still take the initiative to assume social responsibility in the face of entrepreneurial risks and crises, and become entrepreneurs with firm beliefs, lofty ideals, innovative consciousness, and creative thinking.

## 4. Conclusion

Entrepreneurship education has been booming in China's higher education at the present stage. The proportion of entrepreneurship education courses in the curriculum system of various majors in colleges and universities is constantly increasing. Due to the strong practicality of entrepreneurship education, experiential entrepreneurship courses have also become the focus of entrepreneurship education curriculum development. Ideological and

political education and entrepreneurship education have strong similarities and correlations in talent training objectives and training methods. Therefore, the organic integration of the two has strong operability. Compared with traditional classroom teaching, the experiential entrepreneurship course has the characteristics of openness and practicality in the classroom, and the students' learning experience is higher, so the acceptance of ideological and political education is higher. In this way, students have a deeper understanding of the ideological and political elements, such as honest operation, social responsibility, innovation, and high-quality development, in the context of experiencing the real operation of enterprises. In this paper, several typical experiential entrepreneurship courses are set up to fully explore the ideological and political elements, extract the ideological and political points of the course, and summarize the specific ideological and political education content of each course, to provide a useful reference for the comprehensive and effective integration of ideological and political education into entrepreneurship education in colleges and universities.

There are still two limitations in this paper. First, there are great differences in the establishment of entrepreneurship education courses in different colleges and universities. The ideological and political education methods proposed in this paper may have applicability problems, especially in colleges and universities with few experiential courses, which need to be adjusted according to the specific situation. Secondly, although the teaching purpose and teaching content of the ideological and political education module are clearly stipulated in the outline of the entrepreneurship education curriculum, the off-campus entrepreneurial tutors and entrepreneurs in the experiential entrepreneurship curriculum are not full-time teachers in colleges and universities. It is difficult to grasp the integrity and depth of ideological and political education in the curriculum. Therefore, to ensure the smooth development of ideological and political education in entrepreneurship courses, it is necessary not only to control the school's well-designed teaching management system, but also to carry out extensive communication and coordination between school entrepreneurship education teachers and off-campus tutors, and entrepreneurs.

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# Research on the Value and Path of Vocational Education in Promoting the Dynamic Inheritance and Innovation of Fujian's Intangible Cultural Heritage

Yaling Zhuang\*

Zhangzhou Health Vocational College, Zhangzhou, Fujian 363000, China

*\*Author to whom correspondence should be addressed.*

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**Abstract:** As an important base for cultivating technical and skilled talents in China, vocational colleges play a crucial role in promoting the dynamic inheritance and innovation of Fujian's intangible cultural heritage. In this regard, this article first briefly analyzes the value of vocational colleges in the protection of intangible cultural heritage, and then proposes effective strategies in response to the problems of vocational colleges in the inheritance and protection of intangible cultural heritage, hoping to provide some valuable references for readers.

**Keywords:** Vocational education; Fujian's intangible cultural heritage; Inheritance and innovation

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## 1. Introduction

In the new era, the party and the government attach great importance to the inheritance and development of excellent traditional culture. In 2017, China issued "Opinions on Strengthening the Education of Traditional Opera under the New Situation" and "The Outline of the National Cultural Development and Reform Plan during the 13th Five-year Plan Period." In 2018, the Ministry of Education issued "Notice on the Construction of Inheritance Bases for Excellent Traditional Chinese Culture." These policy documents clearly emphasize that "it is necessary to strengthen the inheritance and development of excellent traditional culture, providing strong policy support for the protection and innovation of intangible cultural heritage." As a major province rich in intangible cultural heritage resources in China, Fujian has abundant intangible cultural heritage resources, such as Fujian Nanyin, puppetry, Gezai Opera, woodblock New Year pictures, etc. These intangible cultural heritage resources are not only the precious spiritual wealth of the people in Fujian but also an important part of excellent traditional Chinese culture. However, with the continuous development of society and technology, a large number of intangible

cultural heritages face the risk of losing their inheritance. Therefore, in the new era, how to effectively protect these intangible cultural heritage resources that carry rich historical and cultural elements has gradually become one of the urgent problems to be solved. As an important base for cultivating professional talents in China, vocational colleges have significant advantages in promoting the inheritance and development of intangible cultural heritage. They should keep up with the trend of the times and deeply integrate vocational education with intangible cultural heritage through various methods and means <sup>[1]</sup>. This can not only inject new vitality into the inheritance and development of intangible cultural heritage but also improve the quality of talent training, laying a solid foundation for students' future employment and career development <sup>[2]</sup>.

## **2. The significance of vocational colleges in promoting the inheritance and development of Fujian's intangible cultural heritage**

### **2.1. Inheriting excellent traditional culture**

Intangible cultural heritage is an important part of excellent traditional Chinese culture, containing rich historical elements and cultural values <sup>[3]</sup>. However, in the new era, with the rapid development of science and technology, some intangible cultural heritages face the risks of extinction and loss of inheritance. As an important base for cultivating technical and skilled talents in China, vocational colleges have rich educational resources and talent reserves, which can provide strong support for the inheritance and development of intangible cultural heritage. Vocational colleges can offer intangible cultural heritage courses and incorporate them into the education system <sup>[4]</sup>. In this way, students can deeply understand the historical development, cultural content, and memory characteristics of intangible cultural heritage, enhance their understanding and awareness of intangible cultural heritage, and thus better inherit and develop it <sup>[5]</sup>.

### **2.2. Strengthening students' cultural confidence**

Intangible cultural heritage is the crystallization of the wisdom of the Chinese nation, containing unique cultural elements of the Chinese nation <sup>[6]</sup>. It is an important carrier for implementing ideological and political education, moral education, and aesthetic education. Introducing intangible cultural heritage into vocational colleges can effectively strengthen students' national identity and enhance their cultural confidence. There are inextricable links between intangible cultural heritage and national identity. It is not only an inherent attribute of national cultural identity but also an intuitive manifestation of national identity <sup>[7]</sup>. China has a long history and rich culture, with abundant existing intangible cultural heritage resources. Each project and every form of culture reflects a certain period of history in the past. Vocational colleges play an important role in cultivating talents in China, and students are the main force for future construction and development in China, as well as the future hope of the nation and the country. Introducing intangible cultural heritage projects and cultures into colleges, offering intangible cultural heritage courses, and guiding students to participate, enabling them to learn and experience the production of intangible cultural heritage products firsthand, can not only deepen their understanding and perception of Chinese historical culture, enhance their cultural confidence but also enable them to understand the philosophical thoughts and moral concepts contained therein, enhance their national identity, and deeply feel the charm of intangible cultural heritage <sup>[8]</sup>.

### **2.3. Improving students' aesthetic accomplishment**

With the gradual deepening of educational reform, aesthetic education has gradually become one of the important

contents of vocational college education and teaching. Intangible cultural heritage contains a large number of aesthetic education resources. From its birth, inheritance, and development, it reflects the sages' pursuit of beauty and contains rich aesthetic emotions. It is a fertile cultural soil for carrying out aesthetic education in vocational colleges. Introducing it into the campus can enlighten students' minds and moisten their hearts with intangible cultural heritage, achieving the educational goal of laying a foundation and cultivating the soul. By learning intangible cultural heritage projects, students can feel the unique charm of excellent traditional Chinese culture, effectively cultivate their appreciation and aesthetic abilities, and enable them to establish correct thoughts, concepts, and cognitions, thus laying a solid foundation for their future development <sup>[9]</sup>.

## **2.4. Promoting the sustainable development of vocational colleges**

At present, the vocational college education system is constantly being optimized and improved. Introducing intangible cultural heritage can inject new connotations and vitality into the vocational education system. Intangible cultural heritage courses can not only teach students cultural knowledge, strengthen their cognition, and broaden their horizons but also effectively cultivate students' practical abilities, aesthetic abilities, and innovation abilities <sup>[10]</sup>. By participating in intangible cultural heritage project practices, students can not only learn and master intangible cultural heritage skills and have a deeper understanding of the history and culture of the Chinese nation, but also enhance their national cultural pride. In addition, the content of intangible cultural heritage courses promotes cooperation between colleges and enterprises, social structures, the government, and other institutions, and promotes the construction and development of industry-education-research integration, which can provide strong impetus for the sustainable development of colleges.

## **3. The paths for vocational colleges to promote the dynamic inheritance and innovation of Fujian's intangible cultural heritage**

### **3.1. Constructing a curriculum system of "intangible cultural heritage + vocational education"**

#### **3.1.1. Modular curriculum design**

Vocational colleges should construct a modular curriculum system based on students' interests and actual needs, fully combining the characteristics of Fujian's intangible cultural heritage. For example, for performance-based intangible cultural heritage projects such as Fujian Nanyin and Gezai Opera, they can be deeply integrated with "Music Courses" and "Opera and Singing" courses, and corresponding modules can be set up to enrich the teaching content and stimulate students' learning interests. For skill-based intangible cultural heritage projects such as Fuzhou bodiless lacquerware and Zhangzhou woodblock New Year pictures, they can be combined with "Arts and Crafts" and "Art Design" courses, and characteristic teaching modules can be set up. This can not only enable students to better learn and master course knowledge but also help them master intangible cultural heritage skills in practice, and improve their practical and innovation abilities.

#### **3.1.2. Integrated theory-practice teaching**

In the specific curriculum practice, teachers should adhere to the concept of "integrating theory with practice." While teaching students theoretical knowledge, teachers should carry out practical training combined with specific intangible cultural heritage projects to help students internalize knowledge and improve their practical abilities. During the research process, the research group organized and carried out teaching activities relying on the intangible cultural heritage training center. Teachers divided students into groups according to their preferences,

such as paper-cutting groups, Zhangzhou embroidery groups, puppet show groups, and woodblock New Year picture groups. Each group of students could understand intangible cultural heritage knowledge and master intangible cultural heritage skills under the guidance of intangible cultural heritage inheritors. By participating in practical operations personally, students can not only have a deeper understanding of intangible cultural heritage, improve their intangible cultural heritage skills, but also cultivate their team spirit and innovation abilities, achieving multiple benefits.

### **3.1.3. Developing interdisciplinary courses**

At present, with the gradual deepening of vocational education reform, interdisciplinary integration has become a trend. In this regard, vocational colleges should actively explore the development of interdisciplinary courses. For example, intangible cultural heritage can be organically integrated with courses such as “Tourism Management”, “Art Design”, and “Marketing”, and courses such as the design of intangible cultural heritage-themed tourism products, the design of intangible cultural heritage-themed cultural and creative products, and the marketing planning of intangible cultural heritage-themed products can be offered. The research group tried to hold a Minnan intangible cultural heritage creative works production competition with the theme of “New Creative Power of Intangible Cultural Heritage, the Charm of Fujian is in Vogue.” Students were encouraged to innovate and design by combining modern concepts with traditional intangible cultural heritage. For example, the three-dimensional paper-cut narcissus flowers created by students were made into brooches and sold at the cultural and creative market in Zhangzhou Ancient City. In this way, not only can students’ horizons be broadened, their cognition be strengthened, and their cross-cultural abilities be cultivated, but also the inheritance and development of intangible cultural heritage can be promoted. The traditional intangible cultural heritage is organically integrated with modern concepts, making it presented in a more novel and diverse way and enhancing the popularity and social influence of intangible cultural heritage.

## **3.2. Building a teaching staff of “intangible cultural heritage inheritors + professional teachers”**

Teachers are not only important organizers and participants in curriculum teaching, but also play a crucial role in the inheritance and development of intangible cultural heritage. In this regard, vocational colleges should strengthen the construction of the teaching staff and build a teaching staff of “intangible cultural heritage inheritors + professional teachers” to lay a foundation for promoting the inheritance and development of intangible cultural heritage.

### **3.2.1. Establishing a mechanism for inheritors to enter the campus**

In order to improve the effectiveness of intangible cultural heritage curriculum teaching, colleges can establish a mechanism for intangible cultural heritage inheritors to enter the campus, and invite well-known intangible cultural heritage inheritors to serve as part-time teachers in the college, so as to improve the teaching effect and quality of intangible cultural heritage courses. Intangible cultural heritage inheritors have rich theoretical knowledge and practical experience. Through teaching activities, they can pass on their skills and insights to students, which can not only improve the teaching effect of intangible cultural heritage courses but also enable students to more deeply feel the powerful charm of intangible cultural heritage.



### **3.2.2. Strengthening teacher training**

For in-school teachers, colleges should also establish and improve the teacher training mechanism to improve teachers' qualities and abilities. On the one hand, intangible cultural heritage skills training courses can be regularly organized and carried out to strengthen teachers' understanding of intangible cultural heritage and improve their teaching levels and comprehensive abilities. On the other hand, colleges should encourage teachers to participate in various intangible cultural heritage practice projects to improve their practical and innovation abilities. By participating in intangible cultural heritage projects personally, teachers can deeply feel the charm of intangible cultural heritage, understand the production methods and creative processes of intangible cultural heritage skills, and thus better integrate them into curriculum teaching, further improving the teaching effect and quality of courses.

### **3.3. Optimizing the teaching mode of intangible cultural heritage courses**

Some teachers still use traditional teaching modes and methods in intangible cultural heritage courses, resulting in unsatisfactory teaching effects. In this regard, vocational colleges should optimize the teaching mode of intangible cultural heritage courses and adopt diversified teaching methods and models to more effectively improve the teaching effects of intangible cultural heritage courses.

#### **3.3.1. Applying the project-based teaching method**

The project-based teaching method is an innovative teaching model that emphasizes student-centered learning and can effectively stimulate students' learning interests and improve the teaching effects of courses. In this regard, teachers can apply it to intangible cultural heritage courses to improve the teaching effects. For example, in specific teaching practices, some intangible cultural heritage practice projects can be set for students. For example, students are required to complete Zhangzhou embroidery works, narcissus flower carving works, or choreograph puppet shows as semester assessments. In this way, not only can students' participation interests be effectively stimulated, but their classroom participation can be improved, but also their cognition can be deepened, and students can better learn and master intangible cultural heritage skills.

#### **3.3.2. Applying modern educational technology**

At present, educational informatization has become a trend in teaching reform. In this regard, teachers can introduce modern educational technology into intangible cultural heritage courses, and use multimedia, virtual reality, augmented reality, and other technologies to enrich the teaching content, stimulate students' learning interests, and enable them to more deeply feel the charm of intangible cultural heritage. For example, the powerful functions of virtual reality technology can be used to construct a virtual scenario for students, allowing students to observe the creative processes of various intangible cultural heritage skills up close in this scenario. This can not only effectively stimulate students' interests, enable them to intuitively understand and feel intangible cultural heritage, but also enrich their learning experiences and make them more deeply feel the charm of intangible cultural heritage. In addition, the research group also used information technology to construct an online learning platform and an intangible cultural heritage database. Through the online learning platform, students can obtain intangible cultural heritage knowledge anytime and anywhere according to their interests and actual needs, thus effectively improving their learning effects. The intangible cultural heritage database collects various intangible cultural heritage resources, and students can obtain high-quality intangible cultural heritage resources according to

their needs, further broadening their learning channels.

### **3.4. Promoting the integration of industry and education and school-enterprise cooperation**

In order to promote the inheritance and development of intangible cultural heritage, vocational colleges should also actively cooperate with relevant enterprises, promote the integration of industry and education, and school-enterprise cooperation, and jointly cultivate intangible cultural heritage talents. On the one hand, colleges can sign cooperation agreements with relevant enterprises and jointly carry out activities such as intangible cultural heritage skills training and the research and development of intangible cultural heritage-themed cultural and creative products, enabling students to internalize knowledge in practice, better learn and master intangible cultural heritage skills, and effectively improve their innovation and practical abilities. For example, colleges can cooperate with enterprises and require students to design some cultural and creative works with the theme of “Q-version Cartoon Woodblock New Year Pictures.” In the process of participating in the design and production, students can have a deeper understanding of the historical and cultural knowledge of Zhangzhou woodblock New Year pictures, cultivate their practical and innovative abilities, and also promote the dynamic inheritance and innovative development of the ancient intangible cultural heritage of woodblock New Year pictures. On the other hand, colleges can also invite well-known entrepreneurs and outstanding practitioners to participate in intangible cultural heritage courses, and integrate some cutting-edge industry technologies, concepts, and market trends into the teaching content, enabling students to have a deeper understanding of the development trends and market conditions of intangible cultural heritage products, thus laying a foundation for their future career development.

### **3.5. Carrying out intangible cultural heritage practice activities**

In order to promote the dynamic inheritance and innovative development of intangible cultural heritage, colleges can also actively organize and carry out practice activities to strengthen students’ cognition and enhance the popularity of intangible cultural heritage. During the research process, the research group held a paper-cutting activity with the theme of “Ingenuity Creates, Intangible Cultural Heritage Revives.” Students were guided to create paper-cut works based on popular movie and game characters such as Nezha and The Monkey King: A Hero Is Back. Students were also organized and guided to create paper-cut works with the theme of “Harmony” to participate in the Paper-cutting Skills Competition for Secondary Vocational Schools in the 2025 Fujian Vocational College Skills Competition. Through various methods and means, students’ interests in intangible cultural heritage were stimulated, enabling students to have a deeper understanding of intangible cultural heritage and master intangible cultural heritage skills in practice, thus promoting the inheritance and development of intangible cultural heritage.

## **4. Conclusion**

In conclusion, in the new era, vocational colleges play an important role in promoting the dynamic inheritance and innovative development of intangible cultural heritage. In this regard, colleges should closely integrate intangible cultural heritage with vocational education, and through various methods and means, cultivate students’ intangible cultural heritage knowledge, strengthen their cognition, enable them to better inherit and carry forward intangible cultural heritage, and thus lay a foundation for students’ future development.



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## Disclosure statement

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# Data from China: Analysis of Research Hotspots in the Field of Digital Therapeutics in the Chinese Context (1989–2021)

Jike Bai<sup>1\*</sup>, Oriana Luc<sup>2</sup>, Shaobing Liao<sup>1</sup>, Qige Qi<sup>3</sup>, Jing Jin<sup>4\*</sup>, Xuan Liu<sup>5\*</sup>

<sup>1</sup>Dongguan Seventh People's Hospital (Dongguan Mental Health Centre), Dongguan 523000, China

<sup>2</sup>Saint John of NB, Saint John E2K 5G4, Canada

<sup>3</sup>The Third People's Hospital of Longgang District Shenzhen, Shenzhen 518000, China

<sup>4</sup>Innovation Center of Social Technology for Aging of the National Innovation Center par Excellence (NICE), Shanghai, China

<sup>5</sup>NERVTEX Co., Ltd., Seoul, Republic of Korea

*\*Authors to whom correspondence should be addressed.*

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**Abstract:** *Objective:* China is globally leading in digitalization. However, due to language barriers, there are few international studies on digital medicine based on the Chinese context. This paper focuses on Chinese data to explore the distribution and characteristics of research hotspots in the field of digital therapy in China. *Methods:* By quantifying the published literature on digital therapy from 1989 to 2021 in the authoritative Chinese database CNKI, keyword maps were drawn to sort out specific research directions and hotspot distributions in the field of digital therapy in China, and to predict future research trends and challenges. The literature was retrieved from the CNKI database, exported, and converted into CiteSpace 5.7.R2 software for solving six quantitative indicators, clustering, and map drawing. Under the guidance and constraints of the results, the development context, research directions, core keywords, and hotspots in the field of digital therapy were analyzed. *Results:* A total of 458 articles were included. The clustering was credible ( $Q = 0.8379 > 0.3$ ; mean  $S = 0.9447 > 0.6$ ), and 19 significant research directions were obtained ( $S > 0.6$ ). Four high-frequency core keywords ( $F > 33$ ) and eight high-centrality core keywords ( $C > 28$ ) were identified; there were no prominent nodes. *Conclusion:* In the field of digital therapy represented by Chinese literature, there are four mainstream research directions: exploration of digital medical theoretical concepts, multi-field integration of digital medical extensions, digital applications in specific disease scenarios, and infrastructure and policy support. However, from the perspective of literature centrality and mutation indicators, a solid theoretical core and landmark technological breakthroughs have not yet been formed, highlighting the huge potential and challenges of future research and application in this field in the Chinese context.

**Keywords:** Digital therapeutics; CiteSpace; Keyword co-occurrence; Knowledge graph; Hotspot

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# 1. Introduction

With the rapid development of the internet and artificial intelligence technologies in China, various industries are quickly advancing toward digitalization and intelligent transformation, with the healthcare sector being especially prominent. Against this backdrop, Digital Therapeutics (DTx) has emerged. Its advantages include low cost, minimal physician time, and support for patient self-management of health data, which has driven its rapid development globally. DTx is an innovative form of treatment that is based on digital technology and grounded in evidence-based medicine. The Digital Therapeutics Alliance defines it as: delivering evidence-based therapeutic interventions via high-quality software to prevent, manage, or treat medical disorders and diseases<sup>[1]</sup>. Through smart devices, digital platforms, and software programs, DTx provides real-time monitoring and personalized intervention, demonstrating significant application value in areas such as chronic disease, addiction disorders, rehabilitation, and mental health<sup>[2–4]</sup>. In recent years, the field of digital health has developed rapidly worldwide. As a key component of software as a medical device (SaMD), DTx not only complements traditional healthcare but also drives the digital transformation of healthcare services<sup>[5–6]</sup>.

Globally, the U.S., Europe, and some Asian countries are leading in the regulation and practical application of DTx. For example, the U.S. FDA has included DTx in the regulatory framework for SaMD, and some products have entered commercialization and clinical practice. However, promotion is still challenged by insufficient technical standards and clinical validation<sup>[7]</sup>. Commercialization is also affected by funding, data privacy, and cross-border regulatory coordination<sup>[8]</sup>. In China, research and application in the DTx field began later but have grown rapidly in recent years, driven by policy support and technological progress. Early signs of success have been seen in areas like hypertension, non-alcoholic fatty liver disease (NAFLD), and addiction disorders<sup>[9–11]</sup>. However, current Chinese research mainly focuses on application in specific domains, lacking a systematic overview of overall development and research hot spots<sup>[12]</sup>.

Given China's leading position in global digitalization and the scarcity of international research based on Chinese-language digital health due to language barriers, this study uses bibliometric methods to analyze Chinese-language literature on DTx from 1989 to 2021 using CiteSpace software. By constructing knowledge graphs, the study aims to comprehensively reveal the current research landscape and development trajectory of DTx in China, explore the evolution of research hot spots, and predict future trends. The findings aim to support theoretical research, policy-making, and practical implementation of DTx in China, while offering valuable references for the global digital health field.

## 2. Materials and methods

### 2.1. Study subjects

The keywords from literature in the Digital Therapeutics (DTx) field were designated as the study subjects.

### 2.2. Data collection

All Chinese literature related to Digital Therapeutics (DTx) was retrieved from CNKI, with the retrieval date set to May 21, 2021. The search strategy employed was: SU = (digital health) OR (digital therapeutics) OR (digital medicine), covering the time span from the inception of the database to 2021. The search results were reviewed by two researchers who independently examined the titles and abstracts of the literature and excluded irrelevant documents. In cases of differing opinions, consensus was achieved through discussion. If a conclusion could not be reached, a third researcher was consulted for a final decision. The bibliometric analysis utilizing CiteSpace

allows for a certain degree of tolerance for incorrectly included literature (as indicated by unrelated nodes in the spectrum), thereby emphasizing the importance of recall over precision; nonetheless, this study ensured precision through manual screening while maintaining a high recall rate.

### 2.3. Data conversion

The CiteSpace data conversion function was used to reformat the CNKI data for analysis. The fields converted included keywords, authors, publication years, and additional relevant information.

### 2.4. Parameter settings and data preprocessing

Due to CiteSpace software constraints, the earliest analysis start year was set to 1921. Based on recommendations from CiteSpace developers, prior research, and preliminary observations of the retrieved literature, parameters were configured as follows: Time slice = 1 year; Node Type = Keyword; Edge weight algorithm = Cosine; g-index ( $k = 25$ ) per time slice<sup>[13–18]</sup>. The software processed data for field generation, time partitioning, and pruning.

### 2.5. Keyword map generation and metric evaluation

The program was executed, and the AliasList function was used to merge nodes with similar or identical semantics. The resulting keyword maps and a series of metric indicators were obtained, including keyword co-occurrence maps, keyword co-occurrence maps for each slice, and keyword network clustering maps. The measurement indicators included: (1) node frequency (frequency, F); (2) node centrality (centrality, C); (3) node burstiness (burstiness, B); (4) modularity (modularity, Q); (5) silhouette clarity (silhouette, S); and (6) results from three representative class label extraction algorithms (tf\*idf, LLR, MI)<sup>[14, 17, 20–22]</sup>. Indicators “(1)” and “(2)” yielded ranked keyword groups, used to elucidate the developmental trajectory of the field, through an integrated analysis of results from these two measurement methods; indicator “(3)” provided a ranked set of keywords aimed at identifying hot topics in the field, with a significance threshold set at  $B > 10$ , referencing prior studies<sup>[23–25]</sup>; indicators “(4)” and “(5)” produced results ranging from 0 to 1 and -1 to 1, respectively, to evaluate clustering effectiveness, with values closer to 1 indicating stronger clustering quality. A clustering effect was deemed favorable and reliable when  $Q > 0.3$  and  $S > 0.6$ ; indicator “(6)” generated representative labels for each cluster, aiding in the analysis of category characteristics. Since the three algorithms are based on different assumptions, they provide three distinct sets of class labels, which, when analyzed together, yield superior insights. The three authors evaluated and discussed the DTx literature published from 1989 to 2021, culminating in a comprehensive summary based on the directions and constraints outlined by each map and measurement indicator. Following the generation of each indicator, additional functionalities of CiteSpace were employed for result refinement, including: (1) Utilizing the CitationHistory function to identify nodes with high burstiness, particularly those experiencing sudden increases; (2) After clustering, employing the Timeline function to convert the map into a timeline view, which identifies the time span of various literature.

### 2.6. Map interpretation

The upper left corner of the map indicates the software version information, the computation time of the results, time slice information (Slice length), the number of network nodes (N), the number of edges (E), and the network density, among other details. The colors of nodes and edges correspond to the graphical illustration above (from blue to orange), representing the years in which the corresponding keywords were used, with red indicating nodes that do not correspond to any specific year, suggesting high burstiness. The size of the node label text is positively

correlated with frequency—larger text indicates a higher occurrence frequency of the keyword. The thickness of the edges reflects the co-occurrence frequency of the keywords; thicker lines denote closer associations. Utilizing two methods for measuring node importance will yield different maps. In the centrality measurement map, nodes are uniformly displayed in yellow, with a larger diameter indicating greater importance; in the frequency measurement map, a larger node indicates higher significance, and the rings surrounding the nodes represent the number of papers published in each respective year (the specific years are indicated in the graphic). A wider ring in year A reflects a higher occurrence frequency for that year.

Upon clustering, nodes that fall into the same category form a unit, each represented by a distinct color for differentiation, with category names indicated by “#” followed by the class label (the three algorithms will automatically identify three different class labels, with the MI algorithm possibly recognizing multiple labels), displayed in red.

Once the clustering graph is converted into the Timeline view, documents from the same cluster are arranged on a single horizontal line, with the document dates positioned at the top of the view, progressing from left to right as time advances.

### 3. Results

#### 3.1. Data extraction results

A total of 1,218 articles were obtained from the literature search. After dual independent screening, 825 irrelevant articles were excluded. Ultimately, 458 articles were included in the analysis.

#### 3.2. Data preprocessing

After setting the parameters in CiteSpace for preprocessing, 33 time partitions were generated. The spatial/node/edge configurations for each partition are detailed in **Table 1**.

**Table 1.** Configurations for the space/nodes/links graph

Year	Selection criteria for nodes	Total	Number of nodes	Number of edges/total
1989	top100%	32	32	57/57
1990	top100%	27	27	47/47
1991	top100%	27	27	47/47
1992	top100%	27	27	47/47
1993	top100%	27	27	47/47
1994	top100%	27	27	47/47
1995	top100%	27	27	47/47
1996	top100%	29	29	48/48
1997	top100%	27	27	47/47
1998	top100%	27	27	47/47
1999	top100%	27	27	47/47
2000	top100%	34	34	68/68
2001	top100%	29	29	50/50

**Table 1 (Continued)**

Year	Selection criteria for nodes	Total	Number of nodes	Number of edges/total
2002	top100%	27	27	47/47
2003	top100%	52	52	135/135
2004	top100%	53	53	89/89
2005	top100%	52	52	102/102
2006	top100%	77	77	178/178
2007	top100%	63	63	111/111
2008	top100%	73	73	199/199
2009	top100%	88	88	220/220
2010	top100%	67	67	178/178
2011	top100%	99	99	226/226
2012	top100%	70	70	118/118
2013	top100%	52	52	93/93
2014	top100%	83	83	171/171
2015	top100%	71	71	146/146
2016	top100%	53	53	88/88
2017	top100%	67	67	114/114
2018	top100%	88	88	164/164
2019	top100%	206	206	520/520
2020	top100%	296	296	705/705
2021	top100%	143	143	429/435

### 3.3. Node clustering, spectra, and associated metrics

After clustering, a total of 23 categories were identified (#0 to #22). Categories #18, #19, #20, and #22 did not yield keywords during the processing with CiteSpace and will be manually reviewed and categorized into similar classes. As shown in **Figure 1**, the overall clustering performance is satisfactory, with a high degree of reliability ( $Q = 0.8379 > 0.3$ ;  $\text{meanS} = 0.9447 > 0.6$ ).



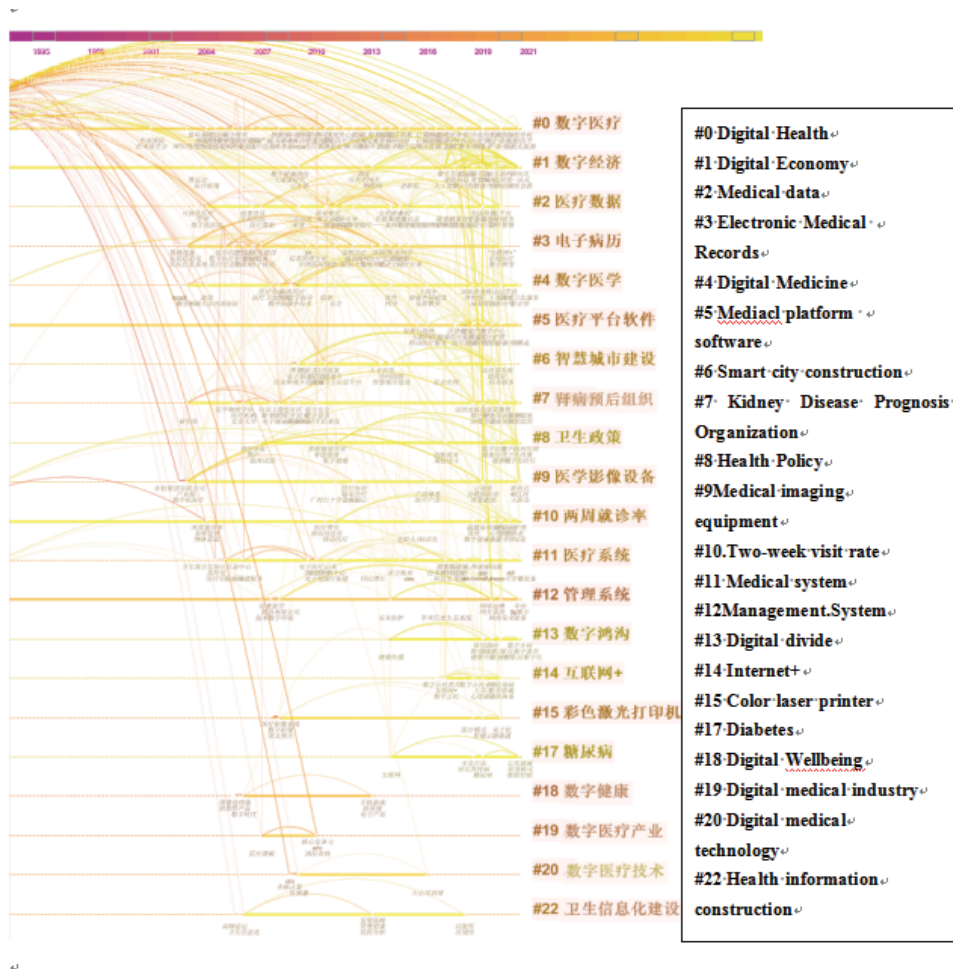


Figure 1. Timeline view

### 3.4. Node weight measurement results and graphs

The frequency and centrality measurement results are summarized in Table 2. A total of 8 nodes exhibit a weight greater than 28 ( $C > 28$ ), and 4 nodes exceed a weight of 33 ( $F > 33$ ), with no significant nodes identified.

**Table 2.** Top weighted keywords detected by the pair of metrics (only those ineffective clusters are listed)

C	Keywords	F	Keywords
304	Digital healthcare**	172	Digital healthcare**
65	Artificial intelligence	35	Chronic disease management
42	Digital economy	35	Health
38	Health management	34	Mdt
34	Electronic medical records	33	Life expectancy prediction
32	Cloud computing	33	Machine learning
30	Epidemic prevention and control	33	Online health information search
29	Industrial park	33	Offline medical treatment behavior
28	Health care	33	Doppler diagnostic instrument
28	Smart healthcare	33	Probabilistic analysis

Note: \*emergent nodes; \*\*overlapping nodes

The top ten projects ranked by SIGMA are as follows: digital healthcare, artificial intelligence, digital economy, health management, electronic medical records, cloud computing, epidemic prevention and control, industrial parks, medical health, and smart healthcare. However, the value for each of these is zero. This indicates that a stable hotspot has yet to emerge in the field of digital healthcare. Additionally, no projects have been identified using BURSTS as an indicator, suggesting a lack of emergence in this research area and indicating that there have not been any significant trends or fluctuations over a period of time.

## 4. Discussion

Bibliometrics posits that scientific knowledge encompasses two fundamental components: the intrinsic “knowledge structure elements”, which establish a stable framework within a domain, and the “research bridging elements”, which create research hotspots and promote innovation. In keyword co-occurrence networks, clustering is employed to identify the former, while high-degree nodes are utilized to detect the latter. Understanding both aspects allows for a clearer comprehension of several critical questions: What are the historical developments of domain hotspots? How long has each hotspot persisted? Are they interconnected or mediated by other hotspots? What are the recent directional changes in these hotspots? Internationally, certain advancements have been made in this area of research. For instance, Erten analyzed the ACM conference proceedings in the field of computer science to map temporal trends and track the evolution and emergence of “hotspots”, revealing that terms like “design” and “system” have consistently maintained their relevance, while phrases such as “automated design” and “database” have surfaced intermittently, effectively forecasting the trajectory of domain development. As articulated by Chen Chaomei, the developer of CiteSpace, the purpose of scientific knowledge mapping is to provide researchers with highly quantitative “intuitive cues,” guiding and constraining literature analysis to mitigate perceptual errors. Scholars should analyze the results generated by CiteSpace in conjunction with their understanding of the field and, when necessary, consult original texts for deeper insights.

In recent years, digital therapeutics (DTx) as an emerging field has garnered increasing attention. Particularly propelled by advancements in large language models and technologies like ChatGPT, the application domains of digital therapeutics are continuously expanding, giving rise to numerous novel application scenarios. These technologies play a crucial role in language translation services for cross-border healthcare and exhibit immense potential in managing areas such as cognitive and mental health disorders, chronic disease management, physical rehabilitation, visual rehabilitation, and drug computation.

### 4.1. Specific research directions in the DTx field

Based on the clustering analysis of keyword co-occurrence networks, this study has identified 19 high-confidence knowledge structure units that represent specific research directions within the DTx field. These directions not only reveal the core framework of the domain but also provide references for emerging research trends. In terms of theoretical concepts related to digital healthcare, the clustering analysis indicates that concepts such as digital healthcare, digital medicine, Internet+, and digital health constitute the foundational areas of DTx research <sup>[26]</sup>. The discussions predominantly revolve around the transformation of digital healthcare models in China, the role of intelligent health management, and the evolution of hospital digitization <sup>[27]</sup>. For instance, with the rapid development of information technology, hospitals are transitioning from basic information systems toward intelligent and integrated solutions, necessitating more systematic theoretical support <sup>[28]</sup>.

In the application domain of digital therapies, the treatment of cognitive and mental health disorders emerges as one of the most active areas of research. The introduction of large language models has made personalized mental health interventions feasible, leading to more intelligent treatment plans. Additionally, the application of digital technologies such as virtual simulations, digital robotics, and medical imaging is increasingly prevalent in clinical healthcare, driving precision and efficiency in diagnosis and treatment. Studies indicate that “Internet+” has profoundly integrated into the healthcare sector, leading to significant transformations in medical service delivery and health management models.

At the macro level of digital healthcare, research topics such as the digital economy, smart city development, digital divide, health policies, and health information systems concern the impact of the digital economy on healthcare and health information issues in smart city initiatives. For example, local governments need to optimize the hardware and software environment to facilitate the integration of the digital economy and healthcare services.

Moreover, the issue of the digital divide faced by the elderly population represents another research hotspot. The phenomenon whereby older adults are marginalized in the digital economy not only affects their quality of life but also poses challenges to health equity. Therefore, investigating the relationship between health disparities among the elderly and the digital divide is crucial for achieving health equity. In the context of disease-related digital healthcare, disease management represents one of the core application scenarios within the DTx field, encompassing aspects such as medical data, renal prognosis organizations, two-week consultation rates, and diabetes management.

Research demonstrates that the level of information technology in modern hospitals directly influences service quality and patient satisfaction. For instance, diabetes management systems based on big data not only enhance patient adherence but also optimize physicians’ clinical decision-making. Furthermore, there has been a significant upward trend in the research of digital therapy applications related to renal diseases and chronic disease management, reflecting the value and potential of digital healthcare in specific disease areas.

Finally, regarding the digital healthcare infrastructure, the clustering also includes nodes such as electronic medical records, cloud computing, and smart healthcare, highlighting the importance of the digital healthcare infrastructure. Electronic medical records, serving as the core tool for information management, combined with cloud computing and smart healthcare, enhance the efficiency of medical data storage, analysis, and sharing. For instance, the introduction of cloud technology provides efficient computing and large-scale storage support for electronic medical records, while smart healthcare optimizes the allocation of medical resources through IoT technologies. Looking ahead, AI-based smart healthcare is anticipated to further enhance diagnostic and treatment efficiencies.

## **4.2. Distribution and evolution of research hotspots in digital therapeutics**

Research indicates that the field of digital therapeutics has yet to establish stable hotspots. High-frequency keywords such as “digital health” and “artificial intelligence” have seen significant increases in usage in recent years; however, their overall impact is insufficient to indicate the formation of a long-term trend. Furthermore, there has been no emergence of keywords that focus on burstness as a core metric, suggesting that the updating speed of hotspots within the field is relatively slow, exhibiting a more balanced development trend.

Nevertheless, it can be observed from the time-zone diagram that in recent years, the application direction of digital health has gradually shifted from a macro framework (such as the digital economy) to specific disease management (such as diabetes and kidney disease), as well as infrastructure development (such as electronic

medical records and cloud computing). This trend reflects the transformation pathway from theoretical exploration to practical application in digital health, highlighting the interaction between technological development and societal needs.

## 5. Conclusion

This study conducted a systematic bibliometric analysis of Chinese literature from 1989 to 2021, utilizing CiteSpace to create a co-occurrence map of keywords, thereby revealing the research hotspots, development trajectory, and future trends in the field of digital therapeutics. The findings indicate that research in digital therapeutics primarily focuses on four areas: exploration of theoretical concepts, interdisciplinary integration, specific disease applications, and infrastructure and policy support. Despite the increasing volume of research in recent years, a solid theoretical foundation and landmark technological breakthroughs have yet to emerge, indicating that this field remains in its early stages of development, with significant potential and challenges ahead.

## Disclosure statement

The authors declare no conflict of interest.

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# Nezha Across Cultures: Language and Translation in Nezha (2019) and Nezha 2

Chun Chen\*

College of International Languages and Cultures, Hohai University, Nanjing 210000, China

*\*Author to whom correspondence should be addressed.*

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**Abstract:** The animated films *Nezha: Birth of the Demon Child* (2019) and its sequel, *Nezha 2*, have not only seen great box-office success in China but also gained global attention. The dialogues, rich in traditional Chinese culture, have captivated audiences worldwide. This paper uses the theories of domestication and foreignization to explore how these translation strategies affect the interpretation of characters and cultural significance by different audiences. It also examines the challenges translators face in preserving the language features and cultural implications of the original dialogues while effectively conveying the film's messages to foreign audiences. By analyzing key lines from the films, this study highlights the role of translation strategies in cross-cultural communication.

**Keywords:** Nezha; Language in Nezha; Domestication; Foreignization; Cross-cultural communication

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## 1. Introduction

Since its release, *Nezha: Birth of the Demon Child* (2019) and its sequel, *Nezha 2*, have achieved box office success in China and played a significant role in spreading Chinese animated films and the culture globally. These films blend traditional Chinese mythology with contemporary values, engaging audiences with their production, emotional depth, and iconic characters. The dialogues, deeply rooted in Chinese culture and language, are a major allure.

Translation plays a crucial role in making these films accessible to global audiences. However, translating culturally rich content, such as humor, idioms, dialect-based jokes, and puns, poses challenges in retaining the original tone and meaning while making it resonate with audiences unfamiliar with Chinese culture.

This paper explores the English translation of some dialogues in the *Nezha* series using domestication and foreignization. While domestication adapts the source language to make the translated version familiar and accessible, often losing some cultural elements, foreignization seeks to retain the cultural features of the source language, allowing the audience to sense its “foreignness.”



By analyzing key lines, this paper examines how these strategies influence the audience's interpretation of the characters and the cultural significance embedded in the dialogue and discusses the challenges translators face in preserving distinctive humor, puns, and other Chinese cultural elements while ensuring clarity in cross-cultural communication.

By exploring these issues, this paper highlights the impact of translation choices on cross-cultural exchange and offers some ideas for effectively translating culturally rich animated film dialogues.

## **2. Theoretical framework**

### **2.1. Domestication and foreignization in translation studies**

Translation studies have long been focused on balancing the preservation of a source text's foreignness with adapting it to the target culture. This balance is shaped by two key strategies—domestication and foreignization—first introduced by the American translation theorist Lawrence Venuti in his work *The Translator's Invisibility: A History of Translation* <sup>[1]</sup>.

In this work, he proposed two main approaches to translation. The first is the foreignizing strategies, which aim to bring the reader closer to the author. By retaining the foreign flavor and cultural distinctiveness of the original text, the translated text allows readers to experience the linguistic charm of the source text. The second is the domesticating strategies. This approach aims to bring the author closer to the reader. By adapting the source text to align with the reader's linguistic habits and cultural background, the translated text becomes easier to understand and accept for the target audience.

Both strategies have their advantages. Foreignization preserves cultural elements of the original text, while domestication makes the text more accessible and reader-friendly. The choice between them often depends on the translation's purpose, audience expectations, and the nature of the source text. Together, they enrich the diversity of translation, allowing each language to express itself in its own unique way.

### **2.2. Review of the two strategies in film translation**

Recent studies have examined the use of domestication and foreignization in film translation, particularly in Nezha. Yang Ziyu found that domestication strategies are often preferred in Chinese animated films translation to ensure efficient information transmission. Creative omissions and adaptations improve the target audience's understanding, but may sacrifice cultural value <sup>[2-3]</sup>. Zhu Huiting and Han Zhulin suggested that translations should be adapted to the cultural habits of the target audience, making their viewing experience more natural and immersive <sup>[3-4]</sup>. Li Mengjie argued that translation is about preserving cultural meaning, not just words <sup>[5]</sup>. Liu Sijie and Fang Qinghua suggested strategies like reinterpretation, explanatory translation, and contextual adaptation to bridge cultural gaps <sup>[6]</sup>.

While domestication helps target audiences understand messages better, it may result in a loss of cultural authenticity. Foreignization preserves cultural identity but can confuse viewers unfamiliar with the source culture. Striking this balance requires carefully tailored strategies. The following section explores how these approaches shape audience interpretation.

### **2.3. Film translation and reinterpretation**

Film translation is crucial in bridging cultural gaps, particularly when dealing with humor, idioms, and other culture-related elements like myths, beliefs, and traditional values. These expressions are deeply rooted in specific

cultural and linguistic contexts, making direct translation challenging, as they rely heavily on shared cultural knowledge. To accurately convey the intended meaning of the source language while preserving its comedic effect and cultural essence, translators often use creative strategies like reinterpretation, explanatory translation, and contextual adaptation. Effective translation balances staying true to the original and making the film accessible and enjoyable for foreign audiences.

### **3. Language and cultural elements in Nezha**

#### **3.1. Linguistic style of Nezha and other key characters**

One of the successes of the two Nezha films lies in their unique linguistic features. Based on traditional Chinese mythology, the films incorporate humor, puns, and modern internet slang into the dialogue, making it humorous, appealing, and resonating with modern young audiences. For example, Nezha's iconic lines “我是小妖怪，逍遥又自在，杀人不眨眼，吃人不放盐” (I am a little monster, free and at ease, killing people without blinking an eye, eating people without salt) are catchy and rhythmic. The playful tone and exaggerated phrases such as “killing without blinking” and “eating people without seasoning” sound absurd yet humorous. This way, a rebellious, carefree, and mischievous boy with a strong personality is vividly created.

Besides, the use of regional dialects also helps bring the characters to life in a more vivid and entertaining way. Take Taiyi Zhenren, for example. He speaks Sichuan dialect, known for its distinctive exaggerated tone and witty and amusing way of expressions. When he says “靓仔来了!” (Here comes the handsome guy!), his playful tone immediately sets the mood for the audience, adding a local cultural touch and highlighting his easy-going personality.

The third language feature of the films is the reinterpretation of traditional mythological characters. Unlike the loyal, righteous, and heroic Nezha in classic mythology, the Nezha in these films is rebellious and defiant. His journey of self-acceptance and personal growth is exemplified by his iconic declaration: “我命由我不由天，是魔是仙，我自己说了算!” (“I am the master of my own fate, not heaven. Whether I am a demon or a god, I decide!”). The resilience and indomitable spirit align with the contemporary values and connect with today's young people deeply.

Similarly, Taiyi Zhenren, traditionally depicted as a composed and dignified mentor, is funny and straightforward in the films, exemplified by his exaggerated line “我可是仙人!” (I am an immortal, you know!). Shen Gongbao, the typically cunning and sinister villain, is portrayed as a multidimensional and complex character. His line “人心中的成见就像一座大山，任你怎么努力也休想搬动” (“Prejudice in people's hearts is like a mountain—you cannot move it no matter how hard you try”) adds depth to his character, making him more relatable.

#### **3.2. Traditional Chinese cultural references in dialogue**

With an abundance of traditional Chinese cultural elements integrated into the dialogue, the two Nezha films exhibit a unique charm. First, traditional idioms and expressions are skillfully adapted through dialect humor, contextual contrasts, and modern reinterpretations, yet their core meanings are retained. One of Taiyi Zhenren's most iconic lines, “急急如律令” (Hurry up, do not delay!), is derived from a Taoist incantation that originally means “Execute swiftly, like a law that cannot be disobeyed.” However, in the films, when expressed in the Sichuan Mandarin dialect, the line softens the seriousness of the Taoist magic command, entertaining the audience

while reflecting the traditional values it embodies.

Second, traditional stories from classical literature are reconstructed with modern interpretations in a fascinating way. A case in point is the relationship between Nezha and Ao Bing. They were long-standing enemies in *Fengshen Yanyi* (The Investiture of the Gods). In the two films, they transform into friends and work together to fight against “天劫咒” (the Heavenly Tribulation Curse), which represents an unavoidable fate and prejudice. Nezha is referred to as the “Demon Pill” (魔丸), and Ao Bing as the “Spirit Pearl” (灵珠), concepts rooted in the yin-yang philosophy of traditional Chinese culture. This philosophy, grounded in Taoist thought, emphasizes the unity of opposites. Nezha, fiery and explosive, symbolizes yang within yin, while Ao Bing, gentle and fluid, represents yin within yang. When they join forces to fight against the heavenly tribulation, their yin and yang energies harmonize, thus challenging the conventional belief that “destiny is inevitable.”

### 3.3. Challenges in translating humor and wordplay

Translating humor and wordplay in the two Nezha films can be challenging, particularly when dealing with puns, slang, and double meanings in Chinese. The films use puns such as “魔丸” (Demon Pill) and “灵珠” (Spirit Pearl), which carry connotations of demon and spirit, evil and good, deeply rooted in traditional Chinese culture. This makes them difficult to translate without losing their cultural significance. Additionally, modern slang such as “我命由我不由天” (“My fate is mine to control”) reflects the Chinese philosophical struggle between destiny and personal agency, a concept that’s difficult to fully capture in English as it has no direct equivalent in English culture. These challenges call for a careful translation approach that maintains linguistic precision, preserves cultural depth, and ensures accessibility for audiences, so that the Nezha films’ humor and deeper meanings are effectively conveyed to viewers across languages and cultures.

## 4. Case study: Translation strategies in Nezha films

### 4.1. Key translated lines

The key lines from the Nezha films, which are deeply rooted in the traditional Chinese cultural context, present considerable challenges when translated, as they must be adapted into expressions not only understandable but also meaningful to audiences who have little or no knowledge of Chinese culture. Basically, two different approaches of translation are employed, namely, domestication and foreignization<sup>[7]</sup>. Each aims to resonate with the target audience in its distinctive way.

Take “我命由我不由天” as an example. It is one of Nezha’s iconic lines, reflecting his strong, rebellious, and independent personality. By saying this, Nezha expresses his refusal to submit to fate or the will of heaven, and his determination to take control of his own destiny. This line originates from the Taoist philosophy of defying fate and changing one’s destiny. Below are two different English translations.

The first one, “I am the master of my fate,” adapts the well-known line from William Ernest Henley’s poem *Invictus*. This domesticated version simplifies the original Taoist philosophy of defying destiny and the emotional depth, making it more accessible to English speakers, but at the cost of losing the cultural essence.

The second one, “Heaven has no say in my fate!” is foreignized, retaining the Chinese concept of “天” (heaven) symbolizing fate or natural law. While this translation might sound awkward to Western audiences, it preserves the philosophical idea of challenging destiny and introduces a unique Chinese cultural element.

Other lines in the films illustrate these translation strategies. Madam Yin (Nezha’s mother)’s line “生活你全

是泪，没死就得活受罪” is translated as “Life’s a bitch, and then you die”, using English slang to express the same sense of despair and frustration, making it more accessible to Western audiences, but losing the charm and unique tone of the regional dialect in the original line. Meanwhile, “成见是座大山” is translated as “Prejudice is a great mountain.” While this comparison might feel unnatural in English, it preserves the poetic imagery and cultural essence.

## 4.2. Challenges translators face and suggested strategies

Translating films with culture-loaded elements, like *Nezha*, presents challenges beyond linguistic accuracy. It requires balancing accessibility with cultural context.

*Nezha*’s line “生活你全是泪，没死就得活受罪！” conveys the main message of “being forced to endure suffering” with a mix of dark humor and irony. The phrase “活受罪” has no exact equivalent in English. And the challenge is to preserve its original meaning while ensuring that foreign audiences can understand the sense of frustration and dark humor it carries. A more straightforward translation might be “Life’s all tears, and I am cursed with this pathetic existence!”, conveying the basic idea of feeling helpless by adapting it to resonate emotionally with English speakers. While it loses some cultural weight, it maintains the original tone.

Apart from culturally-specific phrases, the translation of humor and wordplay is also a key challenge, as seen with *Taiyi Zhenren*’s “不 — 好 — 啦！” in Sichuan Mandarin, delivered with an exaggerated, prolonged tone that expresses panic and humor, adding a strong comedic effect. Such expressions are difficult to interpret directly, as there is no equivalent linguistic feature or humor style in English. A possible English equivalent is “Holy—crap—!”, capturing the tone of shock or alarm, though it differs culturally. The key is to prioritize readability, using expressions that resonate with the target audience.

Dialogues like this often carry significant cultural connotations that may be lost in direct translation. Therefore, reinterpretation becomes necessary. Take *Nezha*’s line “你是我唯一的朋友啊，敖丙”，which reflects his deep loneliness and strong desire for acceptance, as he has been labeled a “monster” by others. Ao Bing, sharing a similar sense of isolation, is the only one who truly understands and accepts him. Through this line, *Nezha* intends to mean “Everyone fears and hates me. You’re the only one who sees me for who I truly am.” A literal translation, “You’re my only friend, Ao Bing,” conveys the basic meaning but does not fully capture the emotional depth. A more culturally resonant translation, “You are the only light in my dark world”, would better express *Nezha*’s desperation for connection and understanding, while preserving the emotional and cultural depth of the original line.

## 5. Conclusion

This paper explores the language and translation strategies in *Ne Zha: Birth of the Demon Child* and its sequel, *Ne Zha 2*, focusing on the balance between domestication and foreignization. While domestication makes the films more accessible, foreignization preserves cultural essence. The success of translating such films lies in understanding the target audience’s expectations while staying true to the source text. Effective strategies help bridge cultural gaps, allowing audiences worldwide to appreciate and connect with the depth and beauty of Chinese mythology and culture.

However, the paper is limited to specific case studies. Further research could include exploring a wider range of texts and languages, audience responses, and how the unique Chinese cultural elements like humor can be

preserved in cross-cultural communication, and the brilliant Chinese traditional culture and values can be spread to the whole world in the most effective and appropriate way.

## Disclosure statement

The author declares no conflict of interest.

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# Experience Sharing on the Development and Maintenance of Volunteer Backbones in Social Organizations

Na'mei Guan\*

Guangzhou Yuexiu District Concerned Social Work Service Center, Guangzhou 510000, Guangdong Province, China

*\*Author to whom correspondence should be addressed.*

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**Abstract:** This article explores the experiences and methods of social organizations in the development and maintenance of volunteer backbones. Volunteer backbones play an important role in social organizations. They not only undertake organizational and leadership roles but also can effectively promote the smooth implementation of volunteer service activities. The article expands from the dimensions of the definition, rights and obligations, recruitment and selection, job content, training and incentives of volunteer backbones, combined with the practical cases of the Guangzhou Yuexiu District Concerned Social Work Service Center and other affiliate units, and proposes specific measures such as establishing good communication channels, providing support and resources, respecting and recognizing the contributions of backbones, establishing incentive mechanisms, and strengthening team building, in order to effectively maintain volunteer backbones, stimulate their enthusiasm for participation and service awareness, thereby providing a strong guarantee for the long-term development of social organizations and the smooth progress of volunteer service activities.

**Keywords:** Social organization; Volunteer backbone; Development; Maintenance; Incentive; Training

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## 1. Introduction

As one of the important and indispensable resources of social organizations, volunteers can be seen everywhere in various activities of different sizes. In the “army” of volunteers, some volunteers will be discovered and entrusted with important responsibilities and developed as the core backbone, playing an important role in large-scale volunteer service activities, public welfare construction activities, comprehensive competitions, and the in-depth cultivation of characteristic volunteer brand projects, to inject a steady stream of fresh blood for matching volunteer services <sup>[1-5]</sup>.

In social organizations, the maintenance of the backbone of volunteers is crucial to the long-term development of the organization and the smooth progress of volunteer service activities.



The importance of a volunteer backbone to social organizations is self-evident. What kind of volunteers can be called the backbone, how to better develop and cultivate volunteers as the backbone, how to maintain volunteers after they become the backbone, etc. The author believes that many social organizations have their own standards, and different organizations will have different ways to develop and maintain a volunteer backbone. In order to ensure that the organization's integration of multi-party resources help the organization to develop its core business and deepen professional direction. In the following, the author will start from the practice of his own institution and brother units, and share the experience and knowledge of social organizations in the development and maintenance of a volunteer backbone, and hopes to discuss and exchange with friends in the same profession to accumulate experience. In order to share more systematically with the "Newbie", the author will focus on the definition of volunteer backbone, volunteer backbone rights and obligations, volunteer backbone recruitment, selection and appointment, volunteer backbone work content, volunteer backbone training, and incentives.

## **2. Definition of volunteer backbone**

It usually refers to volunteers who take on organizational and leadership roles in the volunteering process<sup>[6-10]</sup>. They not only have the ability and experience to organize and coordinate volunteers, but also enjoy high authority among volunteers and can assist volunteer organizations and managers to carry out their work effectively. Backbone volunteers are usually responsible for conveying the notice of the volunteer management organization to the volunteers and providing timely feedback on the demands and situations of the volunteers to the volunteer management staff to ensure the smooth progress of volunteer services.

According to the actual situation of several social organizations known to the author, backbone volunteers refer to the social organizations who arrange registration, interview, selection, employment and training, and are qualified, and can undertake various activities of social organizations and carry out various management planning and team work, and can assume the role of organization and leadership in the process of volunteer service. For example: professional volunteers (such as shooting and editing, teaching literature and art, etc.); Volunteers with outstanding ability to lead activities; Volunteers with good service consciousness and service attitude; Brand projects and professional volunteers, etc.

Volunteers are free-flowing, and the backbone of volunteers is no exception. Some volunteers (backbone) will "wear multiple roles" and actively shuttle between the activities of different organizations and teams. As for the mobile volunteers, in addition to actively exploring and maintaining, they can also be consciously and systematically cultivated in advance. Taking the affiliate units of the author's work, Guangzhou Yuexiu District Youth Transformers Social Development Center, Haizhu District Youth Volunteer Association and Huangpu District Youth Volunteer Association as examples, they have a clear goal in volunteer backbone cultivation, that is, to build innovative, interesting, activity-driven volunteer core backbone team and create social value, and cultivate Guangzhou volunteer backbone reserve talents. In order to improve the overall level of volunteer service in Guangzhou, write the story of Lei Feng in the new era with practical actions. How do they do it?

### **2.1. Establish a good communication channel**

Keep close communication with the backbone of volunteers, understand their needs and expectations, and timely transfer the latest information and activity arrangement of the organization to ensure the smooth flow of information from both sides.

## **2.2. Provide necessary support and resources**

Provide necessary training, guidance and resources for the volunteer backbone to help them better perform their duties. At the same time, pay attention to the difficulties and problems they encounter in the process of volunteer service, and provide timely help and support.

## **2.3. Respect and recognize the contribution of the volunteer backbone**

The hard work and contribution of the volunteer backbone should be fully respected and recognized, which can be commended by means of commendation, awards, and issuance of certificates <sup>[11-15]</sup>.

## **2.4. Establish an incentive mechanism**

Formulate a reasonable incentive mechanism to encourage the volunteer backbone to actively participate in volunteer service activities. Points are accumulated according to the number of participation, contribution degree, and other factors of the volunteer backbone, and the points can be used to exchange some practical gifts or services.

## **2.5. Strengthen team building and cultural construction**

Through organizing team building activities and cultural salons, strengthen the communication and cooperation between the backbone of volunteers, and enhance the cohesion and centripetal force of the team. At the same time, strengthen the construction of organizational culture, create a positive, united and friendly organizational atmosphere, so that the volunteer backbone can feel the warmth and care of the organization.

## **2.6. Pay attention to the personal growth of the volunteer backbone**

Pay attention to the personal growth and development of the volunteer backbone, and provide them with learning and development opportunities. Invite them to participate in some professional training, seminars, and other activities to help them improve their professional quality and comprehensive abilities.

The implementation of the above measures can effectively maintain the backbone of volunteers, stimulate their enthusiasm for participation and service awareness, and provide a strong guarantee for the long-term development of the organization and the smooth progress of volunteer service activities.

## **3. Rights and obligations of the volunteer backbone**

### **3.1. Rights**

(1) Priority for participation in voluntary service activities; (2) Give priority to participating in the evaluation activities of the organization; (3) Participate in planning related projects and activities of the organization; (4) Obtain the corresponding i volunteer service hours; (5) Carry out backbone group building activities from time to time; (6) Access to high-value professional training and foreign exchange opportunities; (7) Ask organizations to help solve practical difficulties and problems encountered in volunteering activities; (8) Make criticisms, suggestions, and opinions on the organization of the organization and carry out supervision obligations.

### **3.2. Obligation**

(1) Adhere to the leadership of the party, abide by the laws and regulations of the state, and abide by the charter of the league and the regulations on volunteer service; (2) Recognize the relevant system and value concept of the organization, and actively promote the volunteer spirit; (3) Actively participate in relevant volunteer service

activities arranged by institutions and departments; (4) Participate in the training services carried out by the institutions; (5) do not harm the legitimate rights and interests of the service target; (6) Not engage in profit-making or activities contrary to social morality as the backbone of the organization or as volunteers; (7) Actively maintain the reputation and image of the organization and young volunteers.

## **4. Recruitment, selection, and appointment of backbone volunteers**

### **4.1. Source of backbone volunteers**

Mainly recruited in the Guangzhou area, for university students and social personnel who actively participate in institutional volunteer services.

### **4.2. Recruitment requirements**

18–45 years old, have a sense of belonging to a team, leadership skills, organizational planning experience, and flexible time are preferred.

### **4.3. Recruitment process**

Annual regular recruitment, applicants through the official channels of the organization to register, after the preliminary screening, eligible applicants participate in the organization's backbone interview. After the interview is passed, they will register information (including the resources they hope to obtain and can provide) and sign the volunteer service agreement, and carry out a three-month probation period, and become the official backbone of the center after passing the probation period. The institution will hold an appointment ceremony for those who pass the probation period.

### **4.4. Selection elements**

(1) Identify with the values and cultural concepts of the institution, and abide by the policies and rules of the institution; (2) Have registered an i-volunteer account; (3) Can continue to participate in the organization-related volunteer service work for more than 1 year; (4) Good at communication, good organizational management, and adaptability; (5) Love public volunteer service, agree with dedication, fraternity, mutual help, progressive volunteer spirit, good teamwork; (6) Experience in the management of volunteer service projects is preferred; (7) Other requirements according to different projects or functional groups; (8) The following conditions are preferred: Volunteers who often actively participate in the planning, organization, and specific implementation of departmental activities, volunteers who have outstanding performance in volunteer service activities, and who have professional talent are preferred.

### **4.5. Recruitment**

The organization will hold an appointment ceremony for the successful recruits. The term of office shall be one year. After the completion of one year, they may choose to stay on if they pass the assessment. At the general meeting, the appointment certificate is issued to the new backbone, the work summary and work handover of the previous backbone, and the new backbone delivers a speech and work expectations.

### **4.6. Assessment: Assessment is carried out once a year**

(1) Assessment methods include team mutual evaluation, youth Tronics evaluation, etc.; (2) Develop the backbone

growth record form. Take the responsible person of each group to evaluate, the backbone personal self-evaluation to fill in the backbone growth record form; (3) For those who fail to pass one assessment, the head of each group will convene an internal meeting to decide whether to stay or go, and report to the organization for the record; (4) Assessment content: responsibility, enthusiasm, teamwork and collective honor spirit in daily work; Attendance at various meetings and activities; Whether there is any violation of the relevant system of the institution, the results of the two assessments shall be used as the basis for the annual evaluation.

## **5. Work content of the volunteer backbone**

(1) Participate in the operation of volunteer service projects, including the on-site implementation of volunteer service activities, volunteer recruitment, scheduling, training, maintenance, and other service contents, and regularly communicate with volunteers in the group to understand their work and life conditions, relieve their emotions, and solve difficulties. (2) Regularly collect feedback from volunteers and constantly improve the normal operation of volunteer service projects: Regularly understand the overall situation of volunteer work, including difficulties encountered and matters needing coordination and solution, and edit and submit brief information about work to the member management department. (3) Planning, organizing, publicity, and promotion of project theme activities; (4) Establish project community contact: Establish WeChat groups for each group, and carry out daily contact and management through social tools. (5) Conducted various volunteer service activities, training for new volunteers; (6) Emergency feedback: The backbone volunteers contact the emergency outside the scope of their ability, and should be the first to report to the member management department, the member management department to solve it, or, according to the principle of territorial management, contact the relevant district government for a coordinated solution.

## **6. Volunteer backbone training**

Professional training. Relevant experts, scholars and outstanding volunteers will be invited to give special reports and lectures and carry out special training.

Training camps for elites. According to the needs of different scenarios (online and offline), relevant ability training will be carried out in the form of training camps.

(1) Backbone leading team training: To train the backbone on the ability required for offline leading team, improve skills, and cultivate team spirit (Such as the leader's personal basic quality training, organization, coordination, and communication ability, on-site emergency response ability training. After each activity, organize volunteers to review together, summarize and share experience, exchange ideas, and timely summarize and review the problems, experiences, and puzzles of volunteers). (2) Online recruitment management training: Mainly for online work, including but not limited to online recruitment management training for the backbone volunteers. (3) Experiential training. On the basis of sufficient theoretical knowledge training, strengthen the backbone's further understanding of volunteer service work through games and interactive methods. (4) Carry out backbone group building training to enhance the cohesion of the volunteer backbone. (5) Special training for volunteer service projects (For the backbone of service project operation, such as department-related project introduction, department management mode, etc.). (6) Volunteer service publicity and training. (7) General training: relevant knowledge of volunteers, such as the overall introduction of social organizations (concepts, values, project content, etc.); The ability to use relevant platform systems (i-volunteer, Mai Ke form, Jin data, questionnaire star, SMS



platform, graphite document, etc.). (8) Organize volunteers to go out for communication and learning, and promote self-improvement.

## **7. Encourage the backbone of volunteers**

(1) Certificates and cultural products will be given to the outstanding cadres. (2) Annual selection of the annual “Top Ten backbone”, annual outstanding backbone, etc., and awarding corresponding honorary titles and commendations. (3) The volunteer backbone with excellent performance may be selected to participate in the selection of outstanding volunteers at or above the district level. (4) Provide a formal volunteer service certificate or social practice certificate; (5) Rely on all kinds of media to vigorously publicize the outstanding backbone of volunteer service work; (6) Outstanding volunteer backbone has the willingness to be given priority to become interns and full-time staff; (7) According to the actual situation of the project, the volunteer backbone will be subsidized according to the actual situation of the project during the participation of volunteers. (8) For the backbone who violates the relevant regulations of the organization, the organization will take reminding, education, and other measures according to the circumstances, and in serious cases, remove the post and cancel the recruitment qualification of the volunteer service activities in the organization.

## **8. Summary of “thoughtful” tips**

To maintain good relationships with volunteer backbones, in addition to the mutual guarantee contents mentioned above, for social organizations, it is more important to be “thoughtful.”

(1) There should be a complete backbone management system, and the organization’s staff needs to agree with this process, have an awareness of backbone management, and implement it according to the system. (2) It is necessary to meet and contact with the backbones more often to enhance the relationship (very important), which can be in the form of small meetings, mutual assistance, simple training, sharing sessions (or organizing theme speech sharing sessions), outdoor tea parties or salons, etc. (3) Strive for more participation platforms and performance opportunities for the backbones, welfare subsidies, other activity participation opportunities, recommendation and evaluation for excellence, and give timely praise, feedback, and summary (very important for growth). (4) Interview the stories of the backbones and publish tweets. (5) Select outstanding backbones of the quarter and the year. (6) Consider more from the perspective of the backbones about what they need to promote growth. (7) Have a dedicated person manage and send birthday blessings, custom cards, graduation gifts, etc. (8) Recommend them to participate in the training of the Youth League School and various organizations more often, link some self-improvement training courses for them, and link resources. (9) Take good-looking working scene photos for the backbones to facilitate their sharing externally. (10) Interact more in moments and communities. (11) Actively invite them to participate in activities more often, ask questions to the backbone, and respect their small suggestions in daily life. Adopt and affirm the practices of the backbone as much as possible for reasonable suggestions. (12) Match each backbone with exclusive services. Do not disturb those who are not the backbone for exclusive services, unless the backbone mentions it voluntarily, so that the backbone can focus. (13) Send surprises to the backbones irregularly, such as sending a cultural and creative product and a thank-you letter to their school, ordering refreshing drinks for the backbone team in hot weather, chatting with the backbones from time to time, exerting the gossip spirit of “8G” internet surfing, and shortening the distance with the backbones.

## Disclosure statement

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# Challenges and Countermeasures for the Compliance of Enterprise Employment Management in the Context of the Digital Economy

Jiangyong Liu\*

Guangzhou Huashang College, Guangzhou 510000, Guangdong, China

*\*Author to whom correspondence should be addressed.*

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**Abstract:** With the rapid development of the digital economy, enterprise employment management is facing unprecedented changes. Digital transformation not only brings about efficiency improvements and innovations in flexible employment models but also presents new compliance challenges. This paper explores the compliance issues in enterprise employment management in the context of the digital economy, including unclear legal positioning of new employment relationships, blurred working hours and labor boundaries, conflicts between algorithmic control and the protection of labor rights and interests, etc. Through the analysis of these issues, this paper proposes countermeasures such as constructing a digital compliance management system, optimizing employment models and contract management, strengthening data and algorithm compliance management, and enhancing enterprise compliance management capabilities and legal literacy. The research shows that enterprises should strengthen compliance management during the process of digital transformation to ensure the legality and transparency of employment relationships, thereby promoting the sustainable development of enterprises.

**Keywords:** Compliance; Employment management; Digital economy

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## 1. Introduction

The digital economy, as the most dynamic and innovative field in the global economy today, is developing at an unprecedented pace and profoundly changing every aspect of social life. According to statistics, in 2023, the scale of China's digital economy reached 53.9 trillion yuan, becoming an important engine for economic growth. In the cultural and tourism industry, the in-depth integration of scenic spot operation manpower and digital labor forces provides proactive management, care, and services for tourists, greatly enhancing the quality of tourists' experiences. In the Internet technology industry, the development of automated advertising placement platforms, combined with advertisers' bidding strategies and platform user profiles, can accurately match advertising

demands, reduce labor costs, and improve operational efficiency<sup>[1]</sup>. In the manufacturing industry, the application of various robots and digital services has effectively filled the labor gap, reduced cost waste, and improved production efficiency. For example, with the help of digital technology, the production cycles of benchmark factories in fields such as large aircraft, new-energy vehicles, and high-speed EMUs have been significantly shortened by 30%, and production efficiency has increased by nearly 30%<sup>[2]</sup>. A large-scale automobile dealership group has not only increased labor efficiency by 20%–30% through digital transformation but also solved a series of problems, such as difficult recruitment, high labor costs, many safety hazards, and low automation levels. In 2020, after Beijing's taxi industry accessed the online ride-hailing platform, drivers' incomes increased by 30%, and the empty-driving rate decreased by 20%<sup>[3]</sup>.

At the same time, the rapid development of digital technology has activated work methods such as telecommuting and working from home and has given rise to new labor relationships such as platform-based employment. These innovations not only improve work efficiency and increase employment flexibility but also make the compliance issues of employment management more complex, leading to an increase in labor disputes. How to ensure legality and compliance while protecting innovation has become a key issue that enterprises need to solve urgently.

China's current labor laws and regulations have certain lags in dealing with new employment forms. Enterprises often face problems such as unclear legal application, non-standard social insurance contributions, and imperfect labor contract management in practice. These problems not only increase the legal risks of enterprises but may also affect the basic rights and interests of employees and hinder enterprises from fulfilling their social responsibilities.

Therefore, studying the compliance challenges and countermeasures of enterprise employment management in the context of the digital economy not only has important theoretical value but also has far-reaching practical significance. This paper aims to analyze the main compliance problems faced by enterprises during the digital transformation process, explore their causes, and propose corresponding countermeasures and suggestions to provide theoretical support and practical guidance for enterprise compliance management.

## **2. Characteristics of enterprise employment management in the context of the digital economy**

The digital economy has given rise to diverse employment models, making enterprise employment management characterized by “data-driven, coexistence of flexibility and risks, and interweaving of technological empowerment and institutional lags.”

### **2.1. Data-driven management decisions**

Enterprise employment management has shifted from experience-orientation to data-driven. Management decisions are based on the systematic analysis of human resources data, such as recruitment, performance, and turnover, achieving precise talent allocation and scientific management. Enterprises construct human resources data analysis systems, evaluate employment effectiveness through quantitative indicators, and provide data support for strategic decisions<sup>[4]</sup>.

### **2.2. Algorithm-driven management**

Algorithm-driven management has become another significant feature of enterprise employment management.

Enterprises construct algorithm systems based on mathematical models and statistical analysis to achieve the automated execution of employment management decisions. In the recruitment process, intelligent screening algorithms can automatically evaluate the matching degree of candidates according to job requirements; in performance management, algorithm systems can integrate multi-dimensional data to generate objective performance evaluation results<sup>[5]</sup>. The role of human resources managers has thus changed from direct decision-makers to designers of algorithm rules and supervisors of system operations, with the focus of work shifting to algorithm optimization and result evaluation.

### **2.3. Flexible employment structure**

The digital economy has given rise to diverse employment models, and enterprise employment structures have become highly flexible<sup>[6]</sup>. Core employees coexist with flexible workers, telecommuting combines with on-site work, and full-time and part-time employees collaborate. Enterprises can dynamically adjust human resources allocation according to business needs, forming a more flexible employment system. This structural change directly affects the complexity of employment compliance management.

### **2.4. Intelligent prevention and control of compliance risks**

Enterprise employment management incorporates intelligent compliance monitoring mechanisms to identify potential risks through system warnings. Intelligent contract management ensures the legality of labor relations; automated attendance systems monitor the compliance of working hours management; and built-in compliance inspection mechanisms in the recruitment process prevent discrimination risks<sup>[7]</sup>.

## **3. Opportunities brought by the digital economy era to enterprise employment management**

### **3.1. Digital-driven human resources management decisions**

Through big data analysis technology, enterprises can achieve multi-dimensional mining and analysis of human resources data and construct a scientific employment decision-making support system<sup>[8]</sup>. This system can accurately evaluate the compliance costs, legal risks, and management benefits of different employment methods, providing data support for enterprises to develop compliant and efficient employment strategies. For example, enterprises can identify potential compliance risk points by analyzing the data patterns of historical labor dispute cases; optimize internal management processes by benchmarking the employment compliance practices of leading enterprises in the industry; and proactively respond to the possible impacts of changes in labor laws and regulations through predictive analysis.

According to the research data of Smart Contracts, enterprises that establish a labor employment compliance system through the Compliance Number Zhifa Yongfa Platform have an average reduction of 65% in the cost of handling employment disputes<sup>[9]</sup>. This shows that digital tools not only help enterprises improve management efficiency but also provide strong support for enterprises to deal with risks. The data-driven decision-making mechanism has enhanced the scientific nature of employment management, laying a solid foundation for enterprises to maintain a compliant competitive advantage in a complex and changeable legal environment.

### **3.2. Diverse expansion of flexible employment models**

The development of digital technology has promoted the transformation of enterprise employment models

from the traditional “company + employee” fixed-employment method to the flexible “platform + individual” employment model. The gig economy, relying on Internet platforms, has created a large number of part-time and flexible employment opportunities, enabling enterprises to accurately connect with the professional talents required for short-term projects. For example, by implementing the combination of dynamic employment and employment digitization, the pilot supermarkets of BBK Group have reduced labor costs by 30% <sup>[10]</sup>. The “shared employee” model promotes the optimal allocation of human resources through the temporary deployment of labor forces between enterprises without changing the original labor relations of employees <sup>[11]</sup>.

The popularization of new work methods such as telecommuting has also brought changes to enterprise employment management. The progress of digital technology enables enterprises to flexibly arrange hybrid work models according to business characteristics, balancing the advantages of centralized and remote work, reducing office space investment, and meeting employees’ flexible work needs.

### **3.3. Intelligent employment relations and digital risk prevention**

Digital technology provides enterprises with an unprecedented ability to manage employment relations in a refined manner. Through intelligent contract management systems, e-signing platforms, and digital archives, enterprises can achieve digital management of the entire life cycle of labor contracts <sup>[12]</sup>. This intelligent management not only optimizes process efficiency but also significantly improves employment compliance. The system can automatically compare the consistency of contract terms with the requirements of the latest laws and regulations and remind managers to make necessary corrections; the e-signing platform ensures the legal validity of the signing process and evidence retention; and the digital archive facilitates enterprises to respond to labor inspections and audits at any time.

At the same time, intelligent systems form a “safety net” for enterprise employment compliance management through real-time data collection, intelligent algorithm analysis, and automatic warning mechanisms. The system can continuously monitor the deviations between enterprise employment practices and labor law requirements and issue early warning signals before risk events occur <sup>[13]</sup>. For example, when overtime hours approach the legal limit, social insurance contributions are abnormal, or labor contracts are about to expire, the system will automatically remind relevant responsible persons to take measures. In addition, intelligent systems can automatically match corresponding rights and interests protection measures for different types of employees (such as full-time, part-time, outsourced, and interns), avoiding compliance risks caused by confusion of employment types.

## **4. Challenges brought by the digital economy to enterprise employment management**

### **4.1. Unclear legal positioning of new employment relations**

The new employment models derived from the digital economy have broken the traditional labor-relation identification standards, putting legal application in a difficult situation. The relationship between platform enterprises and workers often falls between labor relations and labor service relations, lacking a clear legal position. In the “Li Xiangguo v. Beijing Tongcheng Biying Technology Co., Ltd. Labor Dispute Case” in 2018, it was for the first time determined that the relationship between platform deliverymen and the platform constituted a labor relation. However, to avoid employment costs, various delivery platforms have developed diverse employment forms through outsourcing and hierarchical subcontracting, making the identification of legal relations increasingly complex.



The differences in regional labor laws and regulations further increase the difficulty of compliance management for cross-regional employment <sup>[14]</sup>. At the same time, issues such as the validity determination of e-labor contracts and the social insurance contribution responsibilities for non-standard employment relations still lack clear regulations. In judicial practice, there are frequent phenomena of different judgments for the same or similar cases. Sometimes, even the arbitration institutions and courts in the same region have opposite opinions, exposing enterprises to significant legal risks and uncertainties.

## **4.2. Blurred working hours and labor boundaries**

The popularity of telecommuting and instant messaging tools has led to an increasingly prominent phenomenon of invisible overtime, such as “not logging off after work.” Although the court has determined that some online standby time constitutes overtime, the law has not yet formed a clear definition standard <sup>[15]</sup>. Enterprises find it difficult to accurately calculate employees’ actual working hours and overtime hours, facing the risk of violating working-hour regulations.

Under the flexible employment model, the working hours of workers are highly fragmented. For example, online ride-hailing drivers are paid by the order, and shared employees work across enterprises. The traditional working-hour system is difficult to apply. This makes issues such as overtime pay calculation and the protection of the right to rest more complex, increasing the possibility of potential labor disputes.

## **4.3. Conflicts between algorithmic control and the protection of labor rights and interests**

Enterprises increasingly rely on algorithms to manage and control the labor process, but there are obvious conflicts between algorithmic management and traditional labor protection systems. In platform-based employment, enterprises use algorithms to precisely control workers. For example, food-delivery platforms use indicators such as the shortest delivery time and the optimal route planning to prompt riders to speed or run red lights, endangering their personal safety and health. This kind of “algorithmic black-box” management lacks transparency, making it difficult for workers to lodge effective complaints or defenses.

Enterprises use digital tools to monitor employees’ behaviors, often over-collecting personal data, triggering risks of privacy violation and data abuse <sup>[16]</sup>. How to balance data application and privacy protection has become a key challenge for enterprise compliance management. In addition, the application of algorithms in recruitment, promotion, rewards, and punishments may lead to employment discrimination. Algorithms based on historical data are likely to solidify biases such as gender and age, and the opacity of the algorithm decision-making process makes it difficult for workers to question its rationality.

## **4.4. Insufficient enterprise compliance management capabilities and legal literacy**

Digital transformation requires enterprises to establish a compliance management system suitable for new employment relations, but most enterprises lack a systematic risk prevention and control mechanism. Especially in new fields such as e-labor contract management, telecommuting compliance supervision, and the fairness guarantee of algorithmic decision-making, enterprise managers have not updated their legal knowledge in a timely manner and find it difficult to accurately apply the latest laws and regulations, increasing the employment risks of enterprises <sup>[17]</sup>. The human resources department faces an increasing number of legal risks, but managers have an insufficient understanding of current labor laws and regulations and pay insufficient attention to newly introduced laws and regulations, resulting in many compliance hidden dangers in daily management.

## **5. Countermeasures for ensuring the compliance of enterprise employment management in the context of the digital economy**

### **5.1. Constructing a digital compliance management system**

Enterprises should establish and improve human resources management systems according to the characteristics of the digital economy and their actual situations, including basic documents such as labor contract management, salary and welfare systems, and performance appraisal standards, and clarify the management norms for different employment forms. Through the human resources management system, the electronic release of regulations and the signing by employees are realized to ensure the legality of the system and the employees' awareness rate. The system automatically records the time when employees view and confirm, providing strong evidence for compliance.

For new work methods such as telecommuting and flexible work, enterprises need to develop clear working-hour definition standards and recording methods to protect employees' right to rest and overtime rights. For new employment models such as shared employment and platform-based employment, enterprises should formulate special management regulations to clearly define the rights and responsibilities between enterprises and workers, avoiding legal risks caused by ambiguous employment relations.

### **5.2. Optimizing employment models and contract management**

Facing the diversification of employment models in the digital economy, enterprises need to clearly distinguish the legal attributes of different models to ensure clear employment relations and reduce compliance risks. For short-term and seasonal tasks, enterprises can use outsourcing or labor dispatch to reduce management burdens. At the same time, flexible employment can also be carried out through gig-economy platforms to ensure employment compliance.

In terms of contract management, enterprises should follow the provisions of the "Labor Contract Law of the People's Republic of China", standardize the contract-signing process, ensure the signing of written contracts, and clarify the rights and obligations of both parties. For flexible employment models, special attention should be paid to the legality and integrity of contract terms to avoid legal risks caused by missing contracts or ambiguous terms. The signing, storage, and management of e-labor contracts are realized through the digital HR system to ensure the transparency and legality of the contract process.

When using employment methods such as shared employment, labor dispatch, and outsourcing, enterprises should clarify the rights and responsibilities of each party through contracts. Technologies such as blockchain can be used to enhance the transparency and traceability of labor contract management, and intelligent analysis tools can be used to monitor compliance status and discover potential problems in a timely manner.

### **5.3. Strengthening data and algorithmic compliance management**

Enterprises should formulate employee data collection and use policies, clarify the purposes and boundaries of data processing, implement data classification and grading management, and strengthen protection measures for sensitive information, such as data encryption and secure storage. Enterprises should obtain the explicit informed consent of employees to ensure data-processing transparency and the legal and compliant use of employee data. In the telecommuting scenario, enterprises should develop clear working-hour definitions and overtime determination standards and establish telecommuting attendance and supervision mechanisms to balance management needs and employee privacy protection and ensure data compliance.

When using artificial intelligence for decision-making in recruitment, performance evaluation, etc.,



enterprises should ensure the fairness of algorithms to avoid compliance risks such as employment discrimination caused by algorithmic biases. A manual review link should be retained, and an algorithm decision-making appeal and correction mechanism should be established to protect employees' rights and interests. At the same time, enterprises should regularly use fairness testing tools to check algorithms to ensure that they do not contain hidden biases.

#### **5.4. Enhancing enterprise compliance management capabilities and legal literacy**

Enterprises should adhere to the “people-oriented” management concept, combine compliance management with enterprise sustainable development, and ensure the positive interaction between legal compliance and enterprise development. Enterprises should establish a dedicated compliance management team, pay close attention to the changes in policies and regulations related to the digital economy, especially in areas such as flexible employment and data security, and adjust employment strategies and management models in a timely manner.

Enterprise managers can participate in industry associations, summits, and other activities to understand industry best practices, exchange compliance management experience with peers, and jointly address the challenges brought by the digital economy. At the same time, human resources managers should continuously improve their legal literacy by self-studying national labor laws and regulations and relevant policies formulated by local governments. HRs should also actively participate in special human resources law training programs organized by local government departments and relevant institutions to understand the latest trends and case analyses of labor laws and regulations and enhance compliance management capabilities.

### **6. Conclusion**

With the continuous advancement of the digital economy, the complexity and challenges faced by enterprise employment management are increasing. Digital transformation has brought new models of efficiency improvement and flexible employment to enterprises, but it is also accompanied by a series of compliance problems, especially legal challenges in new employment relations, working-hour definition, and algorithmic decision-making. This paper analyzes these challenges and proposes relevant countermeasures, aiming to help enterprises establish an effective compliance management system in the context of the digital economy to ensure the legality and transparency of employment management.

However, although many solutions can be applied, enterprises still face multiple difficulties in actual operations, especially in terms of the lagging legal framework and immature technology applications. In the future, enterprises not only need to pay attention to technical support for compliance management but also strengthen their adaptation to and update of laws and regulations, and promote the improvement of relevant policies. The rapid development of the digital economy requires enterprises to find a more balanced path between innovation and compliance to ensure that while enhancing labor efficiency and technology applications, the basic rights and interests of workers are always protected.

In conclusion, the compliance of enterprise employment management is not only related to the avoidance of legal risks but also directly affects the social responsibility and sustainable development of enterprises. With the continuous evolution of the digital economy, enterprises need to continuously improve their compliance management capabilities and optimize employment models in the future to adapt to the challenges of the new situation and achieve long-term sustainable development. By continuously improving the compliance management

system, enterprises can better adapt to the changes of the digital economy era and create greater value for society.

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# Ethical Disputes, Coordinated Behaviors, and the Construction of an Interactive Accountability Model for Non-Governmental Organizations: A Grounded Theory Study Based on a Dryland Farming Project in City H

Zhirui Wang\*

China University of Geosciences, Wuhan 430074, Hubei, China

*\*Author to whom correspondence should be addressed.*

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**Abstract:** Accountability holds significant normative significance in supervising the conduct of accountable entities. This study conducted unstructured interviews with 21 relevant individuals from the dry farming and rain-fed water-saving project team in H City, county and township government departments, village cadres, and farmers. Combined with grounded theory research on texts, it found that the characteristics of the accountability interaction process are: adhering to the principles of “transparency” and “information disclosure” after emergencies, ethical disputes, establishing a feedback mechanism through “villager participation” and “government collaboration”, implementing supervision and evaluation, and conducting dispute coordination. The core contribution of the accountability interaction model built on this basis lies in constructing an effective accountability mechanism for responding to emergencies, providing ideas for revealing the accountability interaction process of non-governmental organizations (NGOs), and constructing their accountability systems.

**Keywords:** Ethical disputes; Dispute coordination; Accountability interaction model; Dry farming and rain-fed water-saving

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## 1. Introduction

The construction of accountability mechanisms for non-governmental organizations (NGOs) has always been an important focus of academic attention <sup>[1]</sup>. As a responsibility pursuit system, the accountability system requires the accountability subject to supervise the performance of duties by organizations and members within its jurisdiction and hold them accountable for negative consequences, which is of great significance in regulating the behavior of the

accountable subject. NGOs rely on funding from donors and participation from local stakeholders, and are required to report on the effectiveness of fund use and accept accountability. Their accountability mechanisms are jointly driven by external compulsion and internal perception, with external compulsion being more critical <sup>[2]</sup>. Because it emphasizes that service effectiveness needs to be based on ethical or value explanations, local stakeholders are more concerned about NGO accountability than funders <sup>[3]</sup>. Therefore, “imposed”, “perceived”, and “adaptive” have become three idealized states of accountability. Among them, externally imposed accountability is formed by the perceptions of local stakeholders, and its transformation can lead to the emergence of adaptive accountability forms <sup>[4]</sup>.

In existing research, the discussion of adaptive accountability is based on the practice of NGO fund management in a pluralistic society, rather than a single funder’s hierarchical accountability logic <sup>[5]</sup>. In this context, although NGOs need to provide “upward accountability” to funders, stakeholders will seek “accountability dialogue”, from which “imposed accountability” and “perceived accountability” give rise to “adaptive accountability” in forms such as narratives, images, games, exhibitions, etc., effectively responding to diverse demands by constructing dialogue spaces. For example, how NGOs achieve sustainable development accountability through mass media and symbolic interaction reveals that adaptive accountability embeds the action logic of organizational behavioral defense and self-criticism <sup>[6]</sup>.

However, academic attention to the collaborative participation and dispute mediation behaviors of responsible parties in ethical disputes is inadequate. Based on this, this paper attempts to explain the forms of NGO adaptive accountability and explore how it deploys coordination actions and constructs a multi-faceted accountability system and dialogue forms in ethical dispute scenarios through grounded research on a dry farming and rainwater harvesting project of an NGO in H City.

## **2. Theoretical framework and research methodology**

### **2.1. Theoretical framework: On the accountability of non-governmental organizations (NGOs)**

Accountability is defined as the process by which an actor explains and justifies its actions to another party, essentially an ethical order exchange of rights and obligations <sup>[7–8]</sup>. This “expected behavior” is not only a technical rule but also shapes and reproduces forms of social life through “structural duality”, influenced by the interpreter’s negotiation and power relations. To this end, NGOs often implement accountability through practices such as reporting and performance evaluations <sup>[9]</sup>.

The logic of being accountable upward to funders and downward to beneficiaries can be further understood as: upward accountability has a hierarchical and compulsory character, relying on instrumental rationality; downward accountability, based on interactive consensus, forms “social accountability,” a more flexible informal form that emphasizes dialogue participation and democratic practice, building a self-awareness of interdependence <sup>[10–11]</sup>. In the “imposed, perceived, and adaptive” accountabilities, imposed accountability is characterized by formal reports and quantitative indicators (upward), perceived accountability conveys social viewpoints based on ethical values (downward), and the balance between the two gives rise to adaptive accountability <sup>[12]</sup>.

As a social practice, the accountability system obtains legitimacy through cognitive, realist, and pragmatic approaches: realism focuses on the equivalence between people and material tools, while pragmatism emphasizes the coordination embedded in an ethical foundation. This study observes in the dry farming and rainwater harvesting project of an NGO in H City that its accountability practices require a consensus among NGOs, the government, and villagers, reflecting a management and coordination dimension beyond mere “exchange.”



## 2.2. Research methodology: Interviews and grounded theory

The dry farming and rainwater harvesting program faces two dynamic stakeholder groups: the government and rural areas. As the executor of groundwater overextraction governance in H City, NGOs need to follow ritualized mechanisms constrained by rules and accept imposed accountability. The patronage relationship network in rural areas and the living conditions of villagers form a perceived accountability relationship with the organization. The identification of these two groups constitutes the basis for the organization's legitimacy, requiring it to provide differentiated responses to responsibilities.

Given the lack of systematic empirical tools in existing research on NGO accountability mechanisms and pre-research indicating that respondents have differing understandings of the scope of accountability, structured questionnaires are difficult to effectively cover diverse perceptions. Therefore, the study designed open-ended interview questionnaires and conducted interviews with a total of 21 individuals from the H City dry farming and rainwater harvesting project team, county and township government departments, village committee liaison cadres, and farmers. The basic information of the respondents is shown in **Table 1**.

**Table 1.** Basic information of respondents

ID	Gender	Units	Interview content	Job title
G-1	Male	County government	As the operational authority of the organization, cooperate with the organization on issues such as dry farming and rain-replenishment programs, personnel arrangements, and upward accountability. Official norms of accountability; And an opinion on the organization’s dryland and rain-fed projects.	Member of the Agriculture Section, Agriculture and Animal Husbandry Bureau
G-2	Male	Town government		Deputy mayor in charge
G-3	Female			Director of Agricultural and Rural Work Office
G-4	Male			Temporary exerciser
G-5	Female			Labor dispatch personnel
N-6	Male	NGOs	The organization’s level of accountability and goals, mission, and vision. Implementation of the accountability system; The ethical values by which the organization operates. And advice on the management system of accountability up and down.	Legal representative/responsible person
N-7	Female			Secretary
N-8	Male			Accountant
N-9	Male			Stewards
N-10	Female			
N-11	Female			
C-12	Male	Village committee	Cooperation with the organization; Understanding and suggestions on the meaning and importance of accountability; An evaluation of the functioning of the organization. And comments on the organization’s dry and rain-fed projects.	Village DIRECTOR
C-13	Male		Deputy village director	
C-14	Male		Battalion detachment leader	
C-15	Female		Accountant	
V-16	Female	Villagers	An understanding of the connotation and importance of accountability; An evaluation of the functioning of the organization. Recommendations for accountability; Comments on the organization’s rain-fed projects; And cooperation with the organization.	
V-17	Male			
V-18	Male			
V-19	Female			
V-20	Female			
V-21	Male			

The research adopted in-depth personal interviews, with each interview lasting approximately 1.5 hours. A flexible and relaxed atmosphere was provided for the interviewees to offer them sufficient space for thinking and expression. The real thoughts were captured by observing their expressions, body language, and details of expression, to deeply understand their cognition of the accountability mechanism of NGOs. Eventually, 21 interview records (more than 310,000 words) were formed. Two-thirds (14 records) were randomly selected for coding analysis and model construction, and the remaining one-third (7 records) were used for theoretical saturation testing.

In the stage of coding analysis and model construction, the research utilized grounded theory and relied on NVivo 11 software. Through three steps of open coding, axial coding, and selective coding, the characteristics and core of the interactive accountability mechanism of non-governmental organizations were explored.

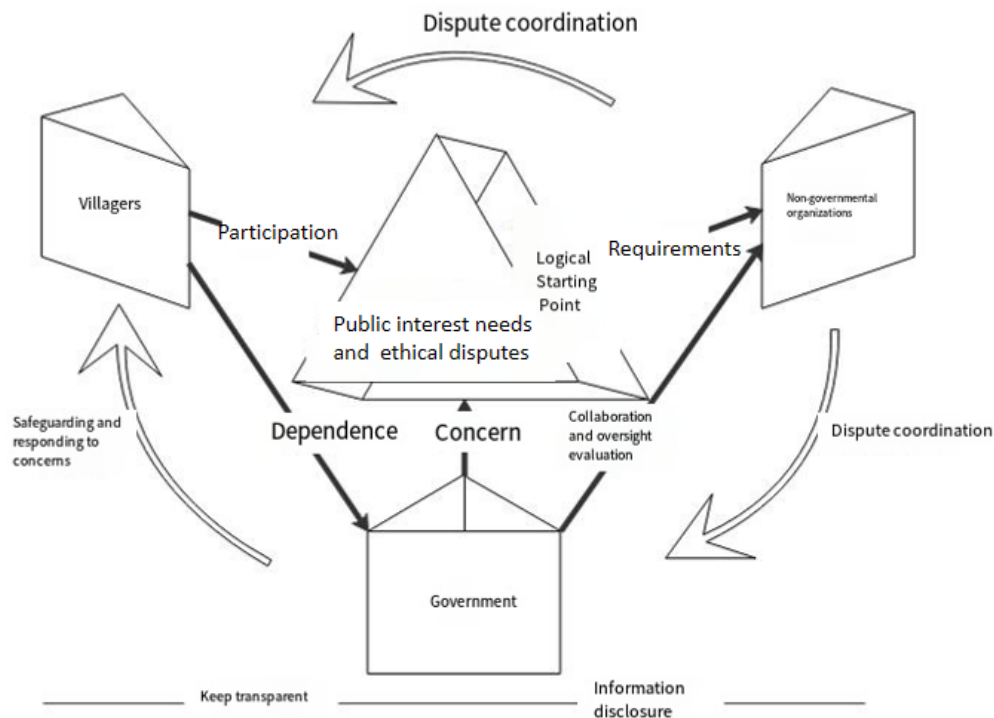
### 3. Accountability interaction model construction: A grounded theory research result

In the open coding process, a total of 131 original statements and concepts related to the characteristics of non-governmental organization (NGO) accountability were obtained. Concepts that appeared less than three times were eliminated, resulting in eight initial categories. Through analysis of these initial categories and further comparison of interview data, the initial categories were subjected to axial coding. The relationships between categories were continuously integrated according to logical relationships until the eight initial categories of maintaining transparency, information disclosure, villager participation, government collaboration, feedback mechanism, supervision and evaluation, ethical disputes, and dispute mediation were reclassified into four main categories as shown in **Table 2**: accountability principles, accountability methods, emergencies, and handling means.

**Table 2.** The results of the axial coding of the interactive characteristics of the accountability system of non-governmental organizations in City H

Numbering	Original representative statement	Primary category	Entries	Main category
V-20	“We often do not have a clear idea of how NGOs allocate money and resources.”	Be transparent	60	Principle of accountability
G-1	“The project information provided by NGOs is not detailed enough for us to monitor.”			
G-2	“They post the proposal on the town government bulletin board when the project is launched.”	Open Information		
N-11	“We try to explain every aspect of the project at the village council meeting.”			
V-16	“We had an opportunity to put our voices forward in the planning stages of the project.”	Villagers participate		
V-21	“Most of the time, we just have to live with what’s been decided.”			
G-5	“We have regular meetings with NGOs to make sure projects run smoothly.”	Government collaboration	57	Ways of accountability
G-1	“There is a certain friction in the cooperation process because the goals are not always aligned.”			
N-7	“We have feedback boxes where villagers can submit their comments anonymously.”	Feedback mechanism		
V-18	“Feedback rarely gets a response, and there is no telling if anyone is really dealing with it.”			
N-6	“We do an evaluation after the project to see if the goals were met.”			
G-3	“We need more professional training to better regulate these programs.”	Monitoring the evaluation		
C-12	“There have been some problems in the allocation of resources, causing discontent in the village.”	Ethical disputes	28	Breaking events
V-19	“Does not feel fairly assisted.”			
N-7	“We organized several meetings to try to address everyone’s concerns.”	Dispute coordination	8	Means of handling
G-5	“They (NGOs) finally adjusted the way they allocated resources to quell the discontent.”			

From the above table, it can be summarized that the characteristics of the accountability interaction process of the non-governmental organization's dryland rain-fed farming project are as follows: After the occurrence of emergencies and ethical disputes, adhere to the accountability principles of "transparency" and "information disclosure", and establish a "feedback mechanism", implement "supervision and evaluation", carry out "dispute coordination" through the accountability methods of "villager participation" and "government collaboration", and finally build the accountability interaction model as shown in **Figure 1**.



**Figure 1.** The interactive model of the accountability system of non-governmental organizations in City H: Based on the results of grounded research

In this interactive model, the accountability logic of non-governmental organizations is manifested as starting from the demands of vulnerable groups, such as villagers and ethical disputes, that is, conflictive issues related to public interests. Based on the principles of transparency and information disclosure, they “wander” between the government and the public to coordinate disputes on conflictive issues. The institutional logic of the government takes guaranteeing and responding to the demands of vulnerable groups, such as villagers, that is, public interests, as the logical starting point. It maintains collaboration with non-governmental organizations and supervises and evaluates their project activities to ensure the legality of non-governmental organization activities and the achievement of public interests. The demand logic of citizens focuses on whether their own demands and interests are met. They are often in a disadvantaged and passive participation position in the “negotiation” with non-governmental organizations and therefore have a high degree of dependence on the government. The core contribution of the interactive model lies in establishing an effective accountability mechanism to deal with emergencies (especially ethical disputes), providing a guarantee for the smooth implementation of the project <sup>[13]</sup>.

First, emergencies trigger the accountability mechanism. In the dryland rain-fed farming project of this

non-governmental organization, emergencies such as ethical disputes are regarded as opportunities to trigger the accountability mechanism. For example, the village director stated in an interview, “(The NGO) had some problems in resource allocation, which caused dissatisfaction in the village” (C-12), making the villagers “feel that they did not receive assistance fairly” (V-19). That is to say, these events include unfair resource allocation, deviations in project implementation, overly hasty project advancement, inadequate guarantee of resource allocation, and other disputes that directly erupted among the villagers. To ensure the smooth progress of the project, when the non-governmental organization faces downward accountability from the villagers, it must take immediate action to safeguard the legitimate rights and interests of the villagers.

Secondly, adhere to the accountability and disposal principle of transparency and information disclosure. The first step of the accountability mechanism is to ensure transparency and information disclosure. For instance, although the relevant staff of the non-governmental organization stated, “We try to explain all aspects of the project at the village committee meeting (N-11)”, some villagers still said, “We usually do not know how the non-governmental organization allocates funds and resources” (V-20). This implies that all information related to the project must be disclosed to all stakeholders and ensure that they understand the implementation, progress, and any possible problems or disputes of the project.

Thirdly, the establishment of villagers’ participation and feedback mechanisms cannot be ignored. In order to establish an effective accountability mechanism, the participation of local villagers must be encouraged, and a good feedback mechanism should be established. For example, when facing the problem that villagers questioned, “Feedback is rarely responded to. I do not know if anyone is really dealing with it.” (V-18), non-governmental organizations, while “setting up feedback boxes where villagers can submit opinions anonymously” (N-7), should respond promptly to the collected feedback to eliminate the public’s doubts about the “whether it is really dealt with” issue. On the basis of this effective feedback, villagers can share their thoughts, concerns, and problems, and non-governmental organizations can promptly understand their feedback and make corresponding adjustments and improvements.

Fourth, pay attention to government collaboration, coordination, supervision, and evaluation. The government plays the role of supervision and support in the accountability mechanism. Government departments need to closely cooperate with non-governmental organizations to jointly promote the implementation of the project and conduct regular supervision and evaluation. This helps to ensure that the project is implemented in accordance with regulations and problems are discovered and solved in a timely manner. Interviews show that the regulatory “gap” between the government and non-governmental organizations stems from the government’s lack of professional knowledge. Therefore, “We need more professional training in order to better supervise these projects” (G-3). In this case, the communication between the government and non-governmental organizations is hindered by the discourse system. Therefore, “There is certain friction in the cooperation process because the goals are not always consistent” (G-1). This requires the government to “hold regular meetings with NGOs to ensure the smooth progress of the project” (G-5) and “conduct evaluations after the project is completed to see if the goals have been achieved (N-6).” In this interaction process, the government needs to strengthen cooperation with non-governmental organizations in specialized fields to enhance communication stickiness and reduce coordination costs. At the same time, non-governmental organizations should actively cooperate with government supervision to ensure the effective achievement of public interests.

## 4. Conclusion and discussion

### 4.1. Research conclusion

The accountability system holds significant normative significance for supervising the behavior of accountable entities. This study, through a literature review, found that academia has paid little attention to how responsible parties collaborate in ethical dispute situations or to coordination behaviors in controversial circumstances<sup>[14]</sup>.

Therefore, based on this literature review, the study conducted unstructured interviews and grounded theory research on text with 21 relevant individuals, including members of an NGO's dry farming and rainwater harvesting project team in H City, staff of relevant departments at the county and township governments, village committee cadres, and farmers implementing the dry farming and rainwater harvesting project. Through open coding and axial coding, eight initial categories—transparency, information disclosure, villager participation, government collaboration, feedback mechanisms, supervision and evaluation, ethical disputes, and dispute coordination—were summarized into four main categories: accountability principles, accountability methods, emergencies, and handling measures.

The grounded theory research revealed that the accountability interaction process of this NGO's dry farming and rainwater harvesting project practice involves adhering to the accountability principles of “transparency” and “information disclosure” after emergencies—ethical disputes occur, establishing a “feedback mechanism” and implementing “supervision and evaluation” through accountability methods of “villager participation” and “government collaboration”, and conducting dispute coordination behaviors. Based on this, a model of accountability interaction was developed. This model proposes that: First, emergencies trigger the accountability mechanism. Second, NGOs should maintain the accountability principle of transparency and information disclosure. Third, the involvement of villagers and the establishment of feedback mechanisms cannot be overlooked. Fourth, emphasis should be placed on collaborating with the government and cooperating with government-led supervision and evaluation efforts. Meanwhile, the core contribution of this model lies in establishing an effective accountability mechanism to respond to emergencies, while also providing useful insights for better revealing the accountability interaction process of NGOs and constructing an NGO accountability system.

### 4.2. Discussion

This paper elucidates the adaptive forms of accountability and coordination mechanisms in ethical disputes through grounded theory research on an NGO's dry farming and rainwater harvesting project in H City. However, the current discussion still focuses on the chained “work-demand relationship” interaction among governments, the public, and NGOs. With globalization and AI development, there are two major areas for expansion in NGO accountability research.

First, the marketization of accountability. In a market-oriented environment, introducing third-party institutions for accountability is a feasible path. The openness and transparency of third-party evaluations can strengthen organizational accountability awareness, increase external oversight pressure, and provide decision-making references for stakeholders. However, the issue of cost-bearing for third-party institutions needs to be addressed, and a model of joint funding by the government, donors, or industry associations can be explored. Meanwhile, strict evaluation standards and procedures should be established to ensure institutional independence and evaluation impartiality<sup>[15]</sup>.

Second, digital empowerment and ethical challenges. Technologies such as big data, artificial intelligence,



and blockchain bring efficiency improvements and expanded participation to NGO project management and community engagement, but they also raise issues such as data privacy, algorithmic discrimination, and lagging technical ethics. Taking the dry farming and rainwater harvesting project as an example, digital technology can be applied to soil data collection, transparency in management, and optimization of community participation, but it is necessary to simultaneously construct ethical response mechanisms: strengthen data protection, conduct regular ethical reviews, establish dedicated supervisory bodies, or utilize blockchain to ensure data immutability and AI algorithms to correct discriminatory outcomes. In addition, NGOs need to establish open forms of accountability through diverse social dialogues (government, academia, communities, etc.) and jointly formulate ethical digital strategies.

NGO accountability research has broad potential in the areas of marketization and digital empowerment. In the future, its accountability subjects, forms, and methods will continue to expand, with the core issue of “effective accountability” needing to permeate research throughout. The academic community is expected to further deepen discussions and promote a better realization of NGOs’ social functions.

## Disclosure statement

The author declares no conflict of interest.

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# Research on the Development Models and Problems of Cultural and Tourism Integration Promoting Rural Revitalization at Home and Abroad

Jing Zhang\*

Suzhou Vocational Institute of Industrial Technology, Suzhou 215000, Jiangsu, China

\*Corresponding author: Jing Zhang, [fish1935@hotmail.com](mailto:fish1935@hotmail.com)

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**Abstract:** With the rapid development of the social economy and the increasing growth of people's spiritual and cultural needs, cultural tourism has become an important force in promoting rural revitalization. This article aims to explore the development models of cultural and tourism integration promoting rural revitalization at home and abroad, analyze their internal mechanisms and practical paths, and provide theoretical support for relevant policy-making and practices. By means of literature review, case analysis, and other methods, this article deeply studies the role of cultural and tourism integration in rural revitalization, the problems faced, and the solutions, and proposes a development model with cultural confidence, industrial integration, and high-quality development as the core.

**Keywords:** Cultural and tourism integration; Rural revitalization; Research on development models

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## 1. Introduction

Rural revitalization is one of the important strategies for China's development in the new era, aiming to promote the comprehensive development of the rural economy, society, and culture. As an emerging industry, cultural tourism, with its unique charm and wide influence, has become an important starting point for rural revitalization. The integration of culture and tourism deeply explores rural cultural resources and combines modern tourism concepts, which not only promotes the development of the rural economy but also promotes the inheritance and innovation of rural culture.

## 2. Literature review

The integration of culture and tourism refers to the integration of cultural elements into the tourism industry to enhance the quality and characteristics of the tourism industry. Domestic and foreign scholars have conducted

extensive research on the definition, current situation, and existing problems of the integration of culture and tourism. Li Ying et al. believe that the integration of culture and tourism can promote the coordinated development of the tourism industry and the rural economy through means such as resource integration and industrial chain extension <sup>[1]</sup>. Zhou Cheng further pointed out that the integration of culture and tourism can achieve the inheritance and innovation of rural culture through ways such as enhancing rural cultural brands and strengthening infrastructure construction <sup>[2]</sup>. However, Wang Lei et al. believe that there are still some problems in the practice of the integration of culture and tourism, such as insufficient development of cultural resources and serious homogenization <sup>[3]</sup>.

Rural revitalization is not only an economic issue but also a cultural one. As an important force in promoting rural revitalization, the integration of culture and tourism realizes the comprehensive revitalization of rural areas through means such as industrial linkage, cultural inheritance and innovation, community participation, and shared development. Cultural confidence is the internal driving force for the integration of culture and tourism to empower rural revitalization, industrial integration is an effective operation method, and high-quality development is the strategic goal.

### **3. Cases of cultural and tourism integration promoting rural revitalization at home and abroad**

#### **3.1. Domestic cases**

##### **3.1.1. Anji County, Zhejiang Province**

Anji County takes green development as the guide, agricultural industry as the support, and beautiful countryside as the basis, and explores a scientific development path of integrated development of the three industries, urban-rural integration, farmers' prosperity, and ecological harmony. Anji County has compiled a number of plans, initially forming a rural leisure tourism pattern, and innovative models such as Lujiacun's "family farm + village + enterprise" and Mulianwu's "farmers + village + enterprise" have emerged. It can be said that Anji County has successfully opened up the transformation channel between lucid waters and lush mountains and golden and silver mountains, creating a beautiful Anji that is livable, suitable for work and tourism, and becoming a model of rural revitalization <sup>[4]</sup>.

##### **3.1.2. The Miao embroidery industry in Kaili City, Guizhou Province**

Miao embroidery is a folk embroidery technique of the Miao ethnic group and an important carrier for the inheritance of Miao culture. The local government has developed a Miao embroidery poverty alleviation plan, cultivating and developing characteristic handicraft enterprises and professional cooperatives. Through the "one-belt-one, one-belt-many" development model, it has radiated and driven more rural women to participate in the embroidery industry. By cooperating with multiple parties, it has created a Miao embroidery brand image, promoting Miao embroidery to go out of the mountains and into the world. These measures have rejuvenated the Miao embroidery industry, making it a beautiful industry that inherits and promotes ethnic culture and drives farmers to increase their income through employment.

#### **3.2. Foreign cases**

##### **3.2.1. Japan's "One Village, One Product" model**

Japan's "One Village, One Product" model is to explore and utilize the unique resources of each village to create

agricultural products or tourism products with local characteristics and promote rural economic development. Its cultural and tourism integration model is that the government formulates policies to encourage and support rural areas to develop characteristic industries. Then, community residents actively participate in the development and promotion of characteristic products, and pay attention to brand building, marketing, and promotion to enhance the popularity and market competitiveness of products. At present, the “One Village, One Product” model has successfully promoted the diversification and specialization of Japan’s rural economy and improved farmers’ income levels.

### **3.2.2. The Provence region in France**

The Provence region is world-famous for its unique lavender culture and rural scenery, and has become a popular tourist destination for domestic and international tourists in France. Relying on characteristic crops such as lavender, it has carried out agricultural sightseeing tourism, attracting tourists to experience rural life. The local area has also combined with the wine industry to create wine chateau tourism projects, allowing tourists to visit vineyards, learn about winemaking techniques, taste fine wines, and delicious food. In addition, various cultural festivals are held, such as the Lavender Festival and the Wine Festival, to enhance tourists’ cultural experience and sense of identity. The Provence region has successfully achieved a win-win development of agriculture and tourism through the integration of culture and tourism, promoting the prosperity of the local economy and the inheritance of culture <sup>[5]</sup>.

## **4. Development models of cultural and tourism integration promoting rural revitalization at home and abroad**

### **4.1. Domestic development models**

Cultural experience: Rely on folk customs resources to develop characteristic products. For example, Gubei Water Town in Beijing has restored historical buildings and developed cultural experience projects such as escort agencies and wineries, promoting tourism upgrading and cultural identity <sup>[6]</sup>.

Agricultural sightseeing: Integrate agricultural and tourism resources to form a complex. For example, the “Sishui Binfen” project in Lingyun County realizes the integration of the three industries through agricultural experiences, helping farmers increase their income and improving the ecological environment.

Characteristic towns: Create immersive spaces with cultural IPs. For example, the “Only Henan” Drama Wonderland in Zhengzhou activates the Central Plains culture through national-trend and drama techniques, promoting industrial transformation.

### **4.2. Foreign development models**

Eco-tourism: Emphasize nature protection and sustainable development, carry out ecological projects such as hiking and cycling, and achieve a win-win situation for environmental protection and diversified economic development.

Heritage tourism: Revitalize historical relics such as ancient castles and churches, and inherit traditions through cultural explanations, enhancing the cultural connotation of tourism.

Creative tourism: Integrate art and tourism formats, develop innovative projects such as theme parks and art festivals, and form differential attractions.



## **5. Problems faced**

### **5.1. Insufficient development of cultural resources**

At present, some rural areas have the problem of insufficient development of cultural resources in the process of cultural and tourism integration<sup>[7]</sup>. Some cultural resources with unique values have not been fully explored and utilized, resulting in serious homogenization of tourism products and a lack of market competitiveness. The reasons for this problem are as follows.

#### **5.1.1. Lack of awareness of cultural resources**

Many places lack in-depth understanding and awareness of their own cultural resources, resulting in these precious resources being ignored or underestimated. For example, some rural areas have rich historical relics, traditional handicrafts, folk activities, etc.<sup>[8]</sup>. However, due to the lack of systematic investigation and evaluation, the uniqueness and value of these resources have not been fully explored and displayed, and are even gradually disappearing.

#### **5.1.2. Lagging development planning**

In the process of cultural resource development, there is a lack of scientific and reasonable planning and layout. Some places lack long-term vision and overall concept when promoting the integration of culture and tourism, resulting in scattered and disorderly development of cultural resources, making it difficult to form scale effects and brand effects. At the same time, the protection of the ecological environment may be ignored during the development process, causing resource damage and waste<sup>[9]</sup>.

#### **5.1.3. Insufficient publicity and promotion**

Sometimes, even if cultural resources have been developed, if the promotion is inadequate, it is difficult to attract tourists to visit and experience. For example, some rural areas lack creativity and strategies in promotion, resulting in limited popularity and influence of cultural resources<sup>[10]</sup>.

### **5.2. Lagging infrastructure construction**

The lagging infrastructure construction, such as inconvenient transportation, poor accommodation conditions, and low-level catering services, directly affects tourists' travel experience and satisfaction, and then affects the effect of cultural and tourism integration and the process of rural revitalization.

#### **5.2.1. Incomplete transportation facilities**

First of all, the transportation facilities in many rural areas are relatively backward. The road conditions are poor, with narrow and potholed roads, which not only affect tourists' travel experience but also limit the accessibility of tourism resources<sup>[11]</sup>. Tourists may give up their trips due to inconvenient transportation when going to rural tourism destinations, thus affecting the development of rural tourism. Secondly, the public transportation system in rural areas is often underdeveloped, with few bus trips and a narrow coverage area, which is difficult to meet the travel needs of tourists. This leads to tourists relying on private cars or chartered car services when traveling in rural areas, increasing travel costs and time costs.

#### **5.2.2. Incomplete public facilities and service support**

Many rural areas lack a complete tourism signage and interpretation system. Tourists may not be able to obtain

effective information guidance and interpretation services in a timely manner during the tour, affecting the tour experience and satisfaction. In addition, public service facilities in rural areas, such as toilets, parking lots, and first-aid stations, are often insufficient in quantity and unevenly distributed, making it difficult to meet the basic needs of tourists <sup>[12]</sup>. This may cause inconvenience or even potential safety hazards for tourists during the tour. Moreover, the accommodation facilities in rural areas are often limited in quantity and simple in conditions, unable to meet the diverse accommodation needs of tourists. Some rural areas may only have a few farmhouses or homestays, and the facilities are old-fashioned, and the service level is low, making it difficult to attract high-end tourists.

### **5.2.3. Low level of informatization**

With the advent of the information age, smart tourism has become an important trend in the development of the tourism industry. However, many rural areas are still lagging behind in the construction of smart tourism, lacking intelligent tourism service systems and platform support, and unable to provide tourists with convenient and efficient tourism service experiences <sup>[13]</sup>. In addition, many rural areas often rely on traditional means such as advertisements and brochures for tourism marketing, lacking the awareness and ability to use emerging media such as the Internet and social media for online marketing. This limits the dissemination and promotion effect of rural tourism brands.

## **5.3. Shortage of talents and low quality**

The development of rural cultural and tourism integration requires professional talent support. However, at present, there is a common problem of talent shortage or low quality in rural areas. The lack of professional tourism management and service personnel directly restricts the speed and quality of the development of cultural and tourism integration, and then affects the comprehensive promotion of rural revitalization.

### **5.3.1. Talent shortage**

The key to the integration of culture and tourism lies in people, especially composite talents who understand tourism and culture. However, many rural areas face a shortage of such talents. Composite talents can not only understand and spread rural culture but also effectively combine culture with tourism to develop attractive tourism products. However, rural areas lack management talents with modern management concepts and practical experience, resulting in low project operation efficiency and making it difficult to achieve sustainable development. At the same time, the revitalization of rural culture requires a group of leaders who love rural culture and can lead cultural development <sup>[14]</sup>. However, many rural areas face a shortage of cultural leaders, resulting in a lack of motivation and direction for the inheritance and development of rural culture.

### **5.3.2. Low quality**

Some rural cultural and tourism practitioners, although they have certain work experience, still need to improve their professional skills. For example, they lack professional knowledge and skills in tourism product development, marketing, and customer service, and are difficult to meet market demands. The integration of culture and tourism requires practitioners to have not only professional skills but also high cultural literacy. However, many rural cultural and tourism practitioners lack cultural literacy, making it difficult to deeply explore and spread rural culture and affecting the quality and attractiveness of cultural and tourism products. In addition, many rural

cultural and tourism practitioners lack innovation ability, making it difficult to develop novel and competitive tourism products, resulting in serious homogenization of rural cultural and tourism products and a lack of characteristics and highlights.

## **6. Countermeasures and suggestions**

### **6.1. Deeply explore cultural resources and create differentiated products**

First, strengthen the exploration and sorting of rural cultural resources, deeply explore cultural resources with unique values, and integrate them into tourism product development. Through methods such as consulting historical documents and local chronicles, combined with on-the-spot investigations and expert consultations, conduct a comprehensive and in-depth investigation and evaluation of rural cultural resources to clarify their uniqueness and value <sup>[15]</sup>.

Second, formulate scientific and reasonable development plans according to the characteristics and values of cultural resources, clarify development goals, layouts, and key tasks. At the same time, pay attention to ecological environmental protection and cultural inheritance to ensure the sustainability of cultural resource development.

Third, innovate the ways and means of publicity and promotion, use new media platforms such as the Internet and social media to expand the scope of publicity and improve popularity. At the same time, formulate targeted marketing strategies and promotion plans in combination with local characteristics and cultural resource characteristics to attract more tourists to visit and experience.

### **6.2. Strengthen investment in infrastructure construction**

First of all, the government should increase investment in rural infrastructure construction, especially in key areas such as transportation, accommodation, and catering. At the same time, encourage social capital to participate in the construction, operation, and management of rural infrastructure. Strengthen the construction and management of tourism service facilities such as accommodation and catering in rural areas to improve service quality and level.

Secondly, attention should be paid to characteristic operation and innovative development, and create tourism brands and products with local characteristics. Strengthen the construction of smart tourism in rural areas and promote the intelligent and convenient development of tourism services. Use modern information technology means such as the Internet and big data to improve tourism service efficiency and tourists' experience and satisfaction.

### **6.3. Cultivate and introduce professional talent teams**

It is necessary to increase the cultivation and introduction of rural cultural and tourism talents. Improve the professional skills and cultural literacy of practitioners through means such as holding training courses and carrying out exchange activities. Secondly, preferential policies can be formulated to attract foreign talent to work and develop in rural areas. Strengthen the training of the service awareness and service level of rural cultural and tourism talents to improve their service quality and tourists' satisfaction. It is also possible to standardize the service behavior of practitioners and improve the overall service level by establishing and improving service standards and evaluation systems. Encourage practitioners to actively innovate and start businesses, and develop tourism products with local characteristics and market competitiveness. For example, local governments can provide policy support such as entrepreneurship guidance and funding to help entrepreneurs overcome difficulties

and achieve successful development.

## 7. Conclusions and prospects

As an important force in promoting rural revitalization, the integration of culture and tourism has played an important role in promoting rural economic development and cultural inheritance. This article uses methods such as literature review and case analysis to deeply study the development models of cultural and tourism integration promoting rural revitalization at home and abroad, as well as their internal mechanisms and practical paths. Future research can further expand the sample range, deeply study different types of rural cultural and tourism integration development models in different regions, and provide more specific guidance for practice. At the same time, attention should be paid to studying the mechanisms and paths of the integration of culture and tourism, empowering rural revitalization from a multi-disciplinary perspective, comprehensively drawing on the theories and methods of related disciplines such as sociology, economics, and management to promote the in-depth development of research.

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# Research on the Talent Selection Model for Grassroots Volleyball Players

Yuxiao Zhang\*

Department of Physical Education, Beijing International Studies University, Beijing 100000, China

*\*Author to whom correspondence should be addressed.*

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**Abstract:** Talent selection is the beginning of competitive sports, and the primary talent selection stage is of utmost importance in the talent selection process. In view of the current situation and problems in grassroots volleyball talent selection, this study summarizes the coaches' talent selection experiences and methods in the practice of grassroots volleyball talent selection, aiming to establish a talent selection model for grassroots volleyball players and provide references for grassroots volleyball talent selection. This study uses the methods of literature review, interviews, the Delphi method, questionnaire survey, mathematical statistics, and logical analysis. After constructing the index system of talent selection methods for grassroots volleyball players, a talent selection model for grassroots volleyball players is established through factor analysis, and each part of the model is analyzed in detail. The conclusions are as follows. (1) The talent selection model for grassroots volleyball players includes 1 first-level index, 5 second-level indexes, and 20 third-level indexes. (2) The basic sports quality factor is the most important part of this talent selection model. The sensitivity and coordination quality test is the part that coaches attach the most importance to, and the others mainly focus on reaction speed, ball sense, and explosive power. (3) The body type prediction factor and the thinking ability factor have similar importance levels in this model, mainly reflected in the prediction of athletes' future height and body type and the judgment of "intelligence." (4) The personality and psychological factor and the spatial sense factor are the main components of the abilities that volleyball players should possess, making this talent selection model more complete.

**Keywords:** Talent selection for volleyball players; Primary talent selection; Talent selection methods; Talent selection model

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## 1. Introduction

In the current grassroots talent selection work, the scientific talent selection theory is difficult to implement effectively due to limitations such as insufficient equipment and funds. Coaches still mainly rely on experience-based talent selection, choosing potential young players based on their long-accumulated experience. This is also the norm in the talent selection of grassroots volleyball players. At present, the scientific talent selection theory

has developed relatively maturely, but it is difficult to be practical in grassroots talent selection due to restrictions on equipment and other reasons, resulting in a disconnection between the scientific talent selection theory and practice <sup>[1]</sup>.

In the field of sports talent selection theory research, researchers mainly use scientific methods that can be specifically quantified and standardized for research. This approach has promoted human understanding and transformation of nature and social progress. However, human beings have both natural characteristics brought by their physical bodies and social characteristics brought by complex emotions. Therefore, the research on humans and athletes is a complex, systematic study. Relying solely on scientific methods has certain limitations. Thus, in the practice of talent selection, how to choose between scientific talent selection and experience-based talent selection is a question worthy of study. Currently, many studies on the primary talent selection stage one-sidedly pursue scientific talent selection methods and arbitrarily oppose experience-based talent selection to scientific talent selection, believing that experience-based talent selection is unscientific. Such a view is difficult to promote the development of talent selection research <sup>[2-3]</sup>.

### **1.1. Research objectives**

The purpose of this study is to summarize the coaches' talent selection experiences and methods in the practice of grassroots volleyball talent selection, and establish a talent selection model for grassroots volleyball players to provide references for grassroots volleyball talent selection <sup>[4]</sup>.

### **1.2. Research significance**

By summarizing the talent selection experiences of grassroots volleyball coaches and establishing a talent selection model for grassroots volleyball players, it can help coaches better discover and cultivate potential volleyball reserve talents, minimize the waste of human and material resources, and promote the efficient development of the cultivation of volleyball reserve talents <sup>[5]</sup>.

## **2. Literature review**

From the literature review, it can be seen that there are many studies on scientific talent selection theories, but few can be organically combined with practice. Especially in the field of volleyball, most studies hold the view that grassroots talent selection lacks scientific theoretical guidance and is relatively backward. Moreover, the research on relevant talent selection index systems still starts from a theoretical perspective and is difficult to truly implement in practice. Therefore, this study attempts to start from the practice of grassroots volleyball talent selection, deeply explore the valuable experiences of grassroots volleyball coaches in talent selection, combine the practical experience of talent selection with scientific talent selection theories, and construct an index system for grassroots volleyball talent selection that is in line with the practice of grassroots volleyball talent selection, has both theoretical guidance and practical feasibility, and can truly provide reference value for actual talent selection work <sup>[6-7]</sup>.

## **3. Research design**

### **3.1. Research objects**

This study takes the talent selection methods for grassroots volleyball players as the research object.

## **3.2. Research methods**

### **3.2.1. Literature review method**

According to the research objectives and content of this paper, 10 relevant books in the library were consulted. Journal websites such as the Beijing Sport University Library, CNKI, and EBSCO series databases were used. By searching for keywords such as “scientific talent selection for athletes”, “talent selection for young athletes”, and “talent selection for volleyball players”, 112 relevant articles were retrieved, providing an important theoretical basis for this research <sup>[8]</sup>.

### **3.2.2. Interview method**

In this study, interviews were conducted with coaches of grassroots volleyball teams to obtain the index of talent selection methods required for the research. The author mainly conducted telephone interviews with relevant coaches. The interview content mainly focused on exploring the talent selection experiences accumulated by coaches in years of grassroots talent selection practice and the experience-based talent selection methods they considered important. The interview content was recorded, summarized, and analyzed to form the required indexes for this study. At the same time, the specific explanations of each index in the research results will also refer to the coaches' interview content <sup>[9]</sup>.

### **3.2.3. Delphi method**

The talent selection index system obtained from the analysis of the interview content with grassroots coaches was screened through the Delphi method in the form of a questionnaire, with a total of 2 rounds of screening. In the first round, the indexes were screened as “suitable” or “unsuitable”, and those with a suitability rate of over 80% were retained. In the second round, the indexes were screened by Likert scale scoring. The indexes with an average score greater than 4.0 and a coefficient of variation less than 0.25 were retained. The average score ensured the importance of the indexes, and the coefficient of variation ensured the consistency of experts' opinions. Finally, all the indexes required for the research were determined, and a questionnaire was formed <sup>[10]</sup>.

### **3.2.4. Questionnaire survey method**

According to the research objectives and requirements, the index system of talent selection methods for grassroots volleyball players retained after the Delphi method screening was formed into a questionnaire named “Evaluation of Indexes of Experience-Based Talent Selection Methods for Grassroots Volleyball Players” in the form of a Likert scale. The results of the questionnaire were used for subsequent factor analysis.

### **3.2.5. Mathematical statistics method**

The survey results of the questionnaire were sorted out and entered into SPSS 26.0 software for data analysis. The factor analysis method was mainly used to analyze each index, so as to construct the talent selection model for grassroots volleyball players.

### **3.2.6. Logical analysis method**

Logical methods such as induction and deduction, analysis, and synthesis were used to analyze each factor in the talent selection model for grassroots volleyball players and the method indexes it contains.

### **3.3. Research focus, difficulties, and innovations**

#### **3.3.1. Research focus**

The focus of this study is to investigate the experience-based talent selection methods for grassroots volleyball players and summarize them to form a talent selection model for grassroots volleyball players.

#### **3.3.2. Research difficulties**

The difficulty of this study is to collect the experience-based talent selection methods for grassroots volleyball players through the interview method.

#### **3.3.3. Research innovations**

This study is based on the practice of grassroots volleyball talent selection, collecting and investigating the coaches' experience-based talent selection methods. The formed model has high feasibility in the talent selection practice and can directly provide effective references for grassroots volleyball talent selection.

## **4. Construction of the talent selection model for grassroots volleyball players**

### **4.1. Determination of the main factors of the talent selection model for grassroots volleyball players**

After screening the indexes collected through interviews by expert questionnaires and coach questionnaires, a total of 29 talent selection method index factors were finally included in the research scope.

After determining the method indexes, the KMO test and Bartlett's test of sphericity were used to determine the internal correlation of the sample data, so as to judge whether the sample data was suitable for factor analysis. When conducting factor analysis, it is generally considered that when the KMO test coefficient  $> 0.5$  and the significance probability of Bartlett's test of sphericity  $< 0.05$ , the questionnaire has a certain structural validity and is suitable for factor analysis. The test results of the sample data of this study show that the KMO value is 0.740, indicating a strong partial correlation among variables. The significance probability  $P$  value of Bartlett's test of sphericity is  $0.000 < 0.01$ , indicating that the hypothesis of independent variables is rejected, and it is suitable for factor analysis.

The eigenvalues of the factor analysis obtained from the sample data show that the eigenvalues of the first 5 factors are greater than 1, and their cumulative variance contribution rate reaches 72.776%. The eigenvalues of the other subsequent factors are less than 1, so it is of little significance to extract them. The first 5 factors can basically reflect the information of the overall variables. Therefore, 5 factors were finally determined.

During the calculation process, according to the correlation degree of each factor under each common factor and the factor load, invalid factors were repeatedly deleted, and deleted factors were added to play a role in dimension reduction and achieve the optimal model. Finally, 20 factors were retained, and 9 factors were deleted. Subsequently, the initial factor matrix was calculated, and the orthogonal rotation was carried out by the varimax method. Finally, 5 common factors were extracted.

The first factor includes seven factors: half-meter-character movement, 36-meter movement, 505 agility test, imitation dig, 30-meter sprint, catching the hexagonal ball rebound, and standing long jump. Since these seven factors are all related to basic sports quality tests, it is named the basic sports quality factor.

The second factor includes five factors: lower limb length, Achilles tendon length, predicted height, upper limb length, and parents' height. Since these five factors are all related to future body type prediction, it is named

the body type prediction factor.

The third factor includes four factors: inquiry after information transfer, simple information transfer, simple action learning, and complex question inquiry. Since these four factors are all related to thinking ability, it is named the thinking ability factor.

The fourth factor includes two factors: simple question inquiry and the neuro-temperament type scale test. Since these two factors are all related to personality and psychological assessment, it is named the personality and psychological factor.

The fifth factor includes two factors: catching a water bottle above the head and catching an irregularly thrown ball. Since these two factors are all related to spatial sense tests, it is named the spatial sense factor.

### **4.3. Summary**

The talent selection model for grassroots volleyball players includes five parts: the basic sports quality factor, the body type prediction factor, the thinking ability factor, the personality and psychological factor, and the spatial sense factor. Each part represents an important characteristic that volleyball players should possess. In the actual talent selection work, coaches should flexibly use this talent selection model according to the needs of the talent selection work and the personal characteristics of the candidates. By giving appropriate emphasis to each aspect and conducting comprehensive considerations, a satisfactory talent selection effect can be achieved.

## **5. Research conclusions and suggestions**

### **5.1. Research conclusions**

The talent selection model for grassroots volleyball players includes 1 first-level index, 5 second-level indexes, and 20 third-level indexes.

The basic sports quality factor is the most important part of this talent selection model. The sensitivity and coordination quality test is the part that coaches attach the most importance to, and the others mainly focus on reaction speed, ball sense, and explosive power.

The body type prediction factor and the thinking ability factor have similar importance levels in this model, mainly reflected in the prediction of athletes' future height and body type and the judgment of "intelligence."

The personality and psychological factor and the spatial sense factor are the main components of the abilities that volleyball players should possess, making this talent selection model more complete.

### **5.2. Research suggestions**

It is recommended that grassroots volleyball coaches refer to the talent selection model for grassroots volleyball players to improve the talent selection system of their own teams.

In this study, only the specific content of each index in the talent selection model for grassroots volleyball players was analyzed. Follow-up research can put it into the talent selection practice to obtain actual data and test its effectiveness according to the actual talent selection results.

## **Disclosure statement**

The author declares no conflict of interest.



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# Talent Introduce Policies in Guangzhou and Shenzhen: A Comparative Study of the Peacock Plan and Guangzhou Talent Plan

Jundi Ruan\*

City University of Hong Kong, Hong Kong, China

*\*Author to whom correspondence should be addressed.*

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**Abstract:** China has made significant efforts to recruit and retain talented individuals to support the development of the country's economy and society. This study focuses on talent introduction policies in two major Chinese cities: Guangzhou and Shenzhen. By comparing two similar policies through discourse analysis, the research finds that the Guangzhou Gathering Talent Plan places greater emphasis on cultivating high-end talent, whereas the Shenzhen Peacock Plan focuses more on talent recruitment. In addition, Guangzhou demonstrates a more decentralized, multi-level government power structure, in contrast with Shenzhen's more vertical and centralized approach to talent management. These differences are attributed to the distinct geographical positions, historical backgrounds, and policy coverage of these two regions. This study recommends that further efforts be made to retain talent effectively following initial recruitment.

**Keywords:** Talent introduction policies; Talent management; Comparative study; Discourse analysis

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## 1. Introduction

Talented people are regarded as essential to a country's development in terms of its economic, social, and political progress. In order to attract and retain such talent, China has implemented a variety of talent introduction policies aimed at promoting innovation and new technologies to drive economic development. From impoverished rural areas to major metropolitan centers, local governments have introduced differentiated policies to meet their specific development needs. For instance, some local governments in underdeveloped regions seek high-level talent capable of devising new strategies to stimulate industrial growth, often leveraging tools such as live-streaming e-commerce using social media to boost local economies. In contrast, large cities may require highly skilled technical professionals to drive innovation in cutting-edge industries such as artificial intelligence and new energy vehicles.

This research focuses on two representative first-tier cities in Guangdong province — Shenzhen and

Guangzhou — with the aim of identifying the key strategies underpinning their respective talent policies. By comparing the similarities and differences in the approaches of these geographically and historically linked cities, this study seeks to uncover the core principles of contemporary Chinese talent policies and the distinctive measures adopted by different cities. Based on the findings, the research will offer recommendations for improving talent retention and management in urban development.

## **2. A review of talent policies and economic development in China**

Countries compete globally by developing a highly skilled workforce to maintain and enhance their positions in an increasingly competitive international landscape. In this context, governments define and identify “talent” based on national needs, designing policies to attract and recruit individuals accordingly. From a national perspective, talent policies are crafted to support the attraction, recruitment, migration, and resettlement of individuals who possess the skills and expertise deemed valuable by the state. Recognizing the pivotal role of talent in national development, China has implemented a range of talent policies aimed at attracting skilled individuals to support its economic and technological advancement <sup>[1]</sup>.

According to a study on the “talent war” in China, the author argued that talent policies have multiple impacts on urban innovation. The policies can enhance regional economic growth, address the urgent need for economic upgrading in cities, incentivize innovation, target various categories of talent, facilitate talent cultivation and retention, and strengthen long-term urban competitiveness <sup>[2]</sup>. As China shifts its economic focus from a pro-GDP growth agenda to one centered on economic upgrading, attracting highly skilled and well-educated individuals has become increasingly important for urban development. This strategic shift has also intensified coordination between the Chinese central government and local authorities. Although these policies generally aim to promote long-term economic development, the short-term benefits often differ across regions.

Local governments adapt central guidelines to suit their specific economic needs, and policy adjustments have further facilitated this localization process. In this context, a number of measures have been implemented to address the escalating challenges brought about by rapid urbanization. These talent policy initiatives have significantly influenced contemporary economic upgrading, as shown in a comparative study of four Chinese cities: Beijing, Shanghai, Shenzhen, and Chongqing <sup>[3]</sup>. Furthermore, talent policies have undergone both changes and continuities. One survey examined dimensions such as policy instruments, policy targets, and policy strength to assess policy sustainability in China. Focusing on Sichuan Province, the study analyzed 30 policies and found that gaps still exist between policy design and practical implementation. While many policies rely heavily on “capital investment” approaches, the importance of “talent information support” is frequently overlooked. Moreover, beyond simply expanding the talent pool, enhancing the quality of talent and talent mobility are both crucial for future development. Governments are therefore advised to prioritize the cultivation of high-quality talent alongside increasing the number of skilled individuals, in order to strengthen overall competitiveness <sup>[4]</sup>.

Although China has made significant efforts in recruiting and retaining talent through its policy frameworks, several issues have emerged in the implementation of these policies. For instance, talent management mechanisms often fall short of expectations. For example, in Sichuan, the government has been criticized for not making full use of the available talent due to a lack of proper training and development opportunities. Additionally, policies should encourage talent mobility and stimulate innovation, which depends on the flow and integration of knowledge. However, current policies often provide broad, macro-level guidance but lack clarity and specific

measures that would enhance flexibility and responsiveness. It is the government's responsibility to supply both material support and institutional mechanisms to incentivize innovation and to maximize the effectiveness and efficiency of human resource utilization <sup>[4]</sup>.

Despite progress, several significant challenges remain in China's talent policies as the country competes in the global "talent war" to support its development goals. Historically, talent migration has been overly focused on economic incentives, often neglecting other critical factors such as career fulfilment, a sense of personal accomplishment, and citizenship considerations. Scholars have argued that effective talent policy should adopt a more comprehensive, multi-level, and long-term strategy that addresses these diverse motivations <sup>[5]</sup>. Further research suggests that three key elements must be addressed for successful talent policy implementation in China: clarity and specificity of policies, a balanced relationship between government intervention and market forces, and tailored policy approaches for different regions. It is also recommended to enhance the monitoring and evaluation of talent initiatives to inform future policy adjustments <sup>[6]</sup>.

Although all researchers agree that talent policies have a significant effect on China's economic development, only a few studies have adopted a micro-perspective to examine the specific content of such policies. While the strategies of policy adjustment and implementation are considered, they are often limited to advocacy-level discussions. Furthermore, even the case studies of specific regions are taken into account, there is rarely a comparative analysis that explores differences in policies across various locations, despite the fact that cities may have divergent needs.

This study aims to fill this gap in the existing literature on China's talent policies and propose potential improvements based on the analysis of its findings. Using the analytical framework of discourse analysis, inspired by Foucault's ideas on discourse and power, this research seeks to uncover the underlying power dynamics embedded in China's talent policy landscape <sup>[7]</sup>.

### **3. A comparative analysis of the Peacock Plan vs. the Guangzhou Talent Gathering Plan**

Guangzhou and Shenzhen are both first-tier cities located in Guangdong, one of the most economically developed provinces in China, and they share many important characteristics. Firstly, both cities have experienced rapid growth, resulting in increased job opportunities and improved infrastructure. They have strong manufacturing industries, excel in attracting foreign investment, and implement programs to bring in skilled workers. Both cities actively support new businesses and innovation. Additionally, their diverse populations, shaped by migration, contribute to vibrant social life and cultural activities. Finally, as key components of the Greater Bay Area, both cities play essential roles in regional cooperation and benefit from strategic trade locations.

This research seeks to explore the differences in talent policies between these two closely linked cities. Two representative talent policies were selected for comparative analysis using a discourse analysis approach, which investigates how language constructs social realities and power dynamics. The talent policy in Shenzhen is known as the Peacock Plan, while Guangzhou's corresponding policy is the Guangzhou Talent Gathering Plan, aimed at attracting skilled individuals to the city.

Using AI tools such as KIMI, relevant policy documents were sourced from official government and media websites. A total of 237 Chinese-language webpages were reviewed and filtered for relevant information. The resulting findings were translated and presented in **Table 1**.

**Table 1.** The comparison of the Peacock Plan vs. the Guangzhou Talent Gathering Plan

Comparison item	Guangzhou Talent Gathering Plan	Peacock Plan
Goal orientation	Build a globally competitive, influential, and leading strategic hub for innovative talent	Develop Shenzhen into an ideal city for gathering international talent, particularly overseas high-level talent, in the Asia-Pacific region
Beneficiaries	Outstanding students, enrolled full-time students, and excellent employees from municipal enterprises and institutions	Overseas high-level talent teams and individuals
Funding content	Provides living expenses, international travel fees, housing subsidies, or talent apartments	Offers reward subsidies, residence, and entry-exit convenience, household registration, and enrolment for children
Service duration	For study abroad funding, a service period of no less than 3 years for those with less than 3 years of study, and no less than 5 years for those with more than 3 years	Not explicitly mentioned
Liability for breach	If the service period is not fulfilled, repay the training funds proportionally and pay a penalty	Not explicitly mentioned
Policy characteristics	Innovative talent evaluation mechanisms, provision of talent green cards, and optimization of talent services	Focus on attracting overseas high-level talent teams and providing substantial reward subsidies
Implementing agencies	Guangzhou Municipal Organization Department, Municipal Human Resources and Social Security Bureau, etc.	Shenzhen Talent Work Leadership Group, Municipal Human Resources and Social Security Bureau, etc.

### 3.1. Diverse goal orientation

Guangzhou Talent Gathering Plan: In terms of goal orientation, the language employed in the Guangzhou Talent Gathering Plan describes its primary objective as creating a “globally competitive and leading strategic hub”, reflecting the city’s ambition in the international talent marketplace. This framing employs a militaristic metaphor of competition, suggesting a sense of urgency and positioning Guangzhou not merely as a participant but as a leader in the global economy. This metaphor also underscores Guangzhou’s aspirational leadership within the Guangdong-Hong Kong-Macao Greater Bay Area. The language conveys a drive for dominance and a proactive approach, which reinforces the city’s authority and legitimizes its role in regional and global development.

Peacock Plan: In contrast, Shenzhen is characterized as an “ideal city of gathering international talent”, employing a more idealistic and inclusive tone. This reflects Shenzhen’s identity as a young and dynamic city, full of vitality. However, the language also implies a more passive governmental role, suggesting that the city focuses more on attracting rather than cultivating talent. Additionally, the term “gathering” introduces a potential bias, creating a welcoming atmosphere for “overseas high-level talent” while implicitly creating a hierarchy that may prioritize foreign talent over local talent. The imbalance could potentially lead to the marginalization of domestically nurtured talent, raising concerns about the long-term sustainability of local talent development.

### 3.2. Different beneficiaries

Guangzhou Talent Gathering Plan: The talent targets various groups, including outstanding students, full-time enrolled students, and excellent employees. This narrative emphasizes the inclusiveness of the talent admission policy, constructing the government as a benevolent authority dedicated to fostering local talent and enhancing its legitimacy. However, the criterion of “outstanding” is defined by the state, which may lead to the marginalization of certain individuals who do not meet the official standards. The beneficiaries are essentially shaped by the



Guangzhou government's authority and its role in local economic development, reflecting a top-down approach to talent identification.

Peacock Plan: The plan's exclusive focus on "overseas high-level talent teams and individuals" reflects an elite-oriented perspective. This discourse implies a governmental valuation of foreign talent over local expertise, reinforcing existing social hierarchies and contributing to the neglect of domestic talent. Such criteria suggest a systemic undervaluation of locally skilled and potentially innovative professionals, which may hinder self-driven innovation and sustainable development within the city.

### **3.3. Funding types**

Guangzhou Talent Gathering Plan: The funding structure is comprehensive, including support for living expenses, international travel fees, and housing subsidies, which contributes to the holistic support for talent development. The discourse presents the government as the primary driver of talent policies, aiming to help talented individuals settle down, achieve career goals, and enjoy a high quality of life through effective subsidy measures. The government is positioned as both the leader and principal agent in providing these subsidies. Furthermore, the diverse funding mechanisms reflect an awareness of the multi-level needs of different categories of talent.

Peacock Plan: In contrast to its Guangzhou counterpart, this plan emphasizes "reward subsidies, residence and entry-exit convenience, household registration, and enrolment for children", which are more directly linked to personal and familial living conditions. This discourse reflects a grassroots perspective that frames the government's role in a transactional relationship with talent, giving more attention to individual well-being and lifestyle quality rather than purely economic gains. From a neoliberal perspective, this policy represents a more comprehensive and humane approach, which may foster a stronger sense of ownership and belonging among recipients.

### **3.4. Service duration, accountability, and penalties**

Guangzhou Talent Gathering Plan: The service duration and accountability serve as indicators of performance and highlight the control exerted by the local government. This structure reinforces the leadership role of state authority in managing talent mobility and retention. While these measures undoubtedly assist in evaluating the outcomes of talent introduction policies, they may also foster a sense of insecurity and pressure among talents, potentially hindering their willingness to innovate.

Peacock Plan: The absence of specified service terms or penalties may enhance the attractiveness of the plan by reducing day-to-day burdens on talents. However, this flexibility may also result in ambiguity regarding the obligations of both the talent and the government. Such a lack of clarity can create power imbalances and may fail to incentivize talents to pursue long-term goals, leading to weaker alignment with state objectives and less commitment to innovation within a structured framework.

### **3.5. Different policy characteristics**

Guangzhou Talent Gathering Plan: Various measures, such as talent green cards and enhanced evaluation systems, focus more on innovative mechanisms and position the government as a progressive authority. This discourse maintains a balanced image of the government as a model in talent management. The narrative suggests that the government is not merely a passive follower of trends, but is an active leader shaping the future landscape of talent acquisition.

Peacock Plan: This plan places greater emphasis on the self-driven efforts of “high-level talent teams”, while the roles of society and government are largely absent. The government merely provides “substantial reward subsidies”, with limited attention paid to talent retention or cultivation. Furthermore, this discourse reinforces existing power structures and may exacerbate social inequalities. The policy strategically prioritizes a selected elite group, thereby establishing a hierarchy within the labor market.

### **3.6. Various implementing agencies**

Guangzhou Talent Gathering Plan: The agencies involved include multiple government bodies, such as the Municipal Organization Department and Human Resources Bureau, which suggests a collaborative governance model. These bodies promote an image of coordinated effort with a strong emphasis on talent-related work. The government’s actions enhance its legitimacy in talent management through tightly connected power structures. This networked approach conveys a sense of shared responsibility among various agencies and ensures more comprehensive and operational talent strategies.

Peacock Plan: The governing agencies in Shenzhen reflect a more centralized control structure under specific leadership groups, indicating a top-down governance approach. This interconnected hierarchy between agencies may limit policy effectiveness and create a disconnect between policy intentions and local needs. The lack of checks and balances in power can result in less responsiveness to on-the-ground realities in the implementation of policies.

## **4. Findings: Discourse dynamics in China’s talent introduction policies**

After comparing of Guangzhou Talent Gathering Plan and the Peacock Plan, the study identified five key differences between the two policies.

Power construction: Both plans utilize discourse to construct governmental authority and stable legitimacy. However, Guangzhou adopts an inclusive and responsible narrative, while the Peacock Plan focuses on a selective, elite-driven approach. These differences reflect contrasting power dynamics and public perceptions of talent.

Talent hierarchies: The discourse reinforces hierarchies of talent. Guangzhou has a broader perspective, providing access to a wide range of opportunities. In contrast, Shenzhen prioritizes high-level international talent, which may marginalize local professionals and create disparities in the labor market.

Talent subjectivity: The Guangzhou Gathering Plan offers comprehensive support for talent, positioning the government as a facilitator of innovation and talent growth. In contrast, the Peacock Plan lacks humanistic care, viewing talent primarily as economic assets for development.

Accountability measures: Guangzhou’s plan includes more comprehensive measures, highlighting different approaches to governance and their implications for talent retention and development, while the Peacock Plan lacks the same level of accountability.

Centralized power: The Guangzhou Talent Gathering Plan balances centralized control with local adaptation, whereas the Peacock Plan employs a top-down strategy, which may limit effectiveness and equity in talent policies.

The discourse analysis of these two policies reveals the intricate power dynamics and the shaping construction of government authority. By examining the definition of talent, government positions, and implications of these policies, researchers can gain a critical perspective on evaluating the role of talent policies in economic

development. Although the talent introduction policies illustrate the dynamics in talent management, they also expose inequities in China's economic structure. This calls for a more inclusive and dynamic talent ecosystem that supports the country's long-term development.

## **5. Discussion**

### **5.1. Several reasons for differences**

Guangzhou is located in the central part of Guangdong province, with its economic influence extending across the entire Pearl River Delta region. Notably, it has strong ties with the other parallel government entities. In contrast, Shenzhen, as a special economic zone, has more autonomy and benefits from its proximity to the Hong Kong SAR, China, enabling more vertical and centralized governance. Additionally, as an ancient trade city, Guangzhou has a strong foundation in various industries, and its role as the capital of Guangdong province helps to cultivate and attract a diverse pool of talented individuals. On the other hand, Shenzhen, a newly emerging city under the guidance of policy since 1978, is primarily focused on high-tech industries. While it has a growing need for high-end talent to drive innovation, its talent cultivation system seems deficient. Shenzhen's position as a special economic zone strengthens the link between the local and central government, contributing to its vertical authority structure.

### **5.2. What can be done to retain talented people?**

There is no doubt that recruiting or introducing talent is important; however, retaining talent may be even more important for governments that seek to focus on long-term innovation. Policies should not only focus on recruiting local and international professionals but also provide more avenues for cultivating and educating talent. Subsidies for specific projects or individuals, such as housing, child education, and healthcare, are essential in improving career development opportunities. The role of governance should be that of an advocate rather than an authority, offering greater flexibility for innovation. These measures are designed to foster a sense of belonging for talent, encouraging them to stay, work, and innovate in specific cities.

## **6. Conclusion**

Talent introduction policies have become increasingly important in China's development. Through a comparative analysis of the Guangzhou Talent Gathering Plan and the Peacock Plan, the study finds that these two cities focus on different aspects of talent strategies. Guangzhou aims to recruit and cultivate its own talent from various fields over the long term, while Shenzhen focuses more on attracting high-end talent to drive technology innovation, but lacks further supporting measures. The roles of government in talent introduction policies differ in these two cities: Guangzhou has a more multi-level and counterbalanced approach, while Shenzhen's system is more vertical and simplified.

This research highlights the discourse and relevance of talent introduction policies. To increase the understanding of such policies, future research should focus on two areas: first, whether this kind of interaction exists in other cities or villages — is this power structure and governance model suitable for other areas, or is it an isolated case within Guangdong? The second area for future research is an exploration of talent policies based on this study, focusing on what measures China can adopt to further develop talent introduction policies. The future of talent policies and the effective utilization of high-end talent will likely continue to be important for China in the long term.

## Disclosure statement

The author declares no conflict of interest.

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# Construction of Performing Arts Ecosystem in International Metropolis — Exploration and Research on Performing Arts Ecological Street in Hainan Commercial Body

Jiong He, Jingying Wang, Tianshuo Jiang

Hainan Vocational University of Science and Technology, Haikou 571126, Hainan, China

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**Abstract:** In the context of globalization and the integration of culture and tourism, the construction of an entertainment ecosystem has become a key path for international cities to enhance their cultural soft power and competitiveness. Hainan, as an important tourist destination in China, offers unique value through its exploratory practices in commercial entertainment eco-districts. This paper delves into the essence and components of an international city's entertainment ecosystem, examines the current development status of commercial entertainment eco-districts in Hainan, discusses the opportunities and challenges they face, and proposes targeted strategies. The aim is to provide theoretical support and practical references for Hainan to create internationally influential entertainment eco-districts and promote the development of international cities.

**Keywords:** International city; Performing arts ecosystem; Hainan business body; Performing arts ecological district

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## I. Introduction

As the global economy integrates and cultures diversify, international cities are not only economic hubs but also centers of cultural and artistic convergence. The performing arts industry, as a core component of the cultural sector, plays a crucial role in enhancing a city's cultural image, promoting cultural exchange, and boosting tourism consumption <sup>[1]</sup>. The construction of a performing arts ecosystem integrates various aspects such as creation, performance, dissemination, and consumption, along with related elements like talent, capital, technology, and policy, forming an organic ecosystem <sup>[2-3]</sup>. Hainan, leveraging its unique geographical location, rich cultural resources, and thriving tourism industry, has actively explored the development of commercial performing arts eco-zones, providing new ideas and practical examples for building an international city's performing arts ecosystem <sup>[4]</sup>.



## **2. The connotation and constituent elements of the international urban performing arts ecosystem**

### **2.1 Content**

The international urban performing arts ecosystem refers to an open, dynamic, and sustainable development system in international cities. At its core is the performing arts industry, encompassing creation, production, performance, dissemination, and consumption, as well as closely related elements such as talent cultivation, financial support, technological innovation, and policy guarantees <sup>[5–6]</sup>. These components are interconnected and interact with each other, forming an open, dynamic, and sustainable ecosystem. It is not only a development framework for the performing arts industry itself but also a comprehensive ecological system that deeply integrates with the city's economy, culture, and tourism industries, collectively driving urban development <sup>[7]</sup>.

### **2.2. Constituent elements**

Core performance elements include various performing arts groups, theaters, and talent agencies. Performing arts groups are the main body of creation and performance, continuously delivering excellent works to meet the cultural needs of audiences; theaters serve as venues for performances, where the completeness of facilities and operational management directly impact the quality of shows and audience experience; talent agencies play a crucial role in promoting performances, artist packaging, and agency services, facilitating the market circulation of performance products <sup>[8–9]</sup>.

Supporting elements: Talent is the key to the development of the performing arts ecosystem, including professional talents such as playwrights, directors, actors, stage designers, lighting and sound technicians, as well as interdisciplinary talents in cultural industry management and marketing <sup>[10]</sup>. Financial support is a crucial guarantee for the development of the performing arts industry, encompassing various channels like government fiscal investment, social capital investment, and financial institution loans <sup>[11–12]</sup>. Technological innovation brings new forms of expression and dissemination methods to the performing arts industry, such as the application of virtual reality (VR), augmented reality (AR), and holographic projection technologies in performances, enhancing visual effects and audience engagement <sup>[13]</sup>.

The performing arts industry is closely linked to tourism, catering, accommodation, and retail. Tourism provides a vast market for performances, where visitors enrich their travel experiences by watching shows. Performances also add cultural depth to tourism, attracting more visitors <sup>[14–15]</sup>. The catering, accommodation, and retail sectors offer complementary services to audiences and tourists, extending their stay in the city and boosting consumption <sup>[16]</sup>.

Policy environment elements: Government policy support is crucial for the construction of the performing arts ecosystem. It includes formulating industrial development plans, introducing preferential tax policies, providing financial subsidies, strengthening intellectual property protection, etc., so as to create a good policy environment for the development of the performing arts industry and guide resources to the gathering of the performing arts industry <sup>[17]</sup>.

## **3. Development status of commercial performance ecological streets in Hainan**

### **3.1. Increasing variety of performing arts projects**

In recent years, Hainan's commercial performance ecosystem has seen the emergence of a diverse range of performance projects. For example, Haikou China-fashion City, as Hainan's first immersive traditional Chinese style performance-themed district, uses the background of "The Book of More Paths" to create an operational model that combines "immersive scene interpretation + experience." The performances integrate Hainan's rich

history and culture, bringing stories of historical figures such as Lady Xian, Su Dongpo, and Hai Rui to the stage. Through vivid storytelling and ingenious choreography, these performances have attracted a large number of residents and tourists. Additionally, some commercial entities have introduced various forms of performances, including music shows, acrobatic acts, and stand-up comedy, catering to the needs of different consumers<sup>[18]</sup>.

### **3.2. The integration of commerce and performing arts is gradually deepening**

Hainan commercial complexes actively explore the integration of commerce and performance. Some commercial complexes enhance their business atmosphere and popularity by hosting performances<sup>[19]</sup>. For example, some commercial streets in Sanya regularly hold art exhibitions, themed markets, and entertainment shows, transforming commercial spaces into venues that combine shopping, leisure, and cultural experiences. Consumers can enjoy wonderful performances and participate in interactive activities after shopping, achieving an organic combination of commercial consumption and cultural consumption<sup>[20]</sup>.

### **3.3. Increasing tourist attraction**

Hainan, as a popular tourist destination, has seen its commercial performance ecosystem districts further enhance its appeal. Many tourists include watching performances in their itineraries, making performances an integral part of travel. For example, the large-scale song and dance show at Sanya's Everlasting Love scenic area presents Hainan's history, culture, and folk customs in a unique artistic form, attracting a large number of domestic and international visitors. It has become one of the iconic projects of Sanya tourism, driving the prosperity and development of surrounding businesses.

## **4. Opportunities and challenges of the construction of a commercial performance ecological street in Hainan**

### **4.1. Opportunities**

Policy support has provided strong policy backing for the development of commercial performance and cultural districts in Hainan Free Trade Port. Measures such as relaxed market access, simplified approval processes, and tax incentives have attracted more performance companies and talents to Hainan. At the same time, the government has increased its support for the cultural industry by setting up special funds for cultural industry development and encouraging innovation and growth in performance projects.

The tourism market has huge potential. Hainan boasts abundant tourism resources and receives a large number of domestic and international tourists every year. With the changing concept of tourism consumption, the demand for cultural experiences is increasing day by day. Commercial performance ecological streets can provide unique cultural tourism products to tourists, meeting their diverse needs and offering broad market development space.

Rich in cultural resources, Hainan's unique history and culture, folk culture, and maritime culture provide abundant material for performance creation. By deeply exploring and utilizing these cultural resources, it is possible to create performance brands with Hainan characteristics and enhance the cultural connotations and appeal of performance products.

### **4.2. Challenges**

A shortage of professional talent has hampered the development of Hainan's performing arts industry, which started relatively late and lacks a sufficient reserve of professionals. There is a lack of outstanding playwrights,

directors, actors, and other core creative talents, as well as professionals in cultural industry management and marketing. This has constrained the innovation of performance projects and the operational development of commercial performance ecosystem zones. The talent cultivation system is incomplete, with few relevant programs offered by local universities, and there is insufficient alignment with market demands.

Brand influence is insufficient. Although Hainan's commercial performance ecosystem has launched some performance projects, the overall brand influence remains limited. Compared to internationally renowned performance brands and districts, there is a significant gap in terms of brand awareness, reputation, and market competitiveness. There is a lack of effective brand promotion strategies, with limited promotional channels, making it difficult to attract more tourists and consumers attention.

The integration of commerce and performance is not deep enough. Currently, the fusion between commercial entities and performances in Hainan is still at an early stage, with a phenomenon of "two separate skins" between commerce and performance. Some commercial entities merely introduce performance activities without deeply integrating them with their business models or developing coordinated plans. The role of performances in boosting commercial consumption has not been fully realized, and the support from commercial entities for the performance industry also needs to be strengthened.

## **5. Construction strategies of commercial performance ecological street in Hainan**

### **5.1. Strengthen talent training and introduction**

To improve the talent cultivation system, local universities and vocational colleges in Hainan should strengthen cooperation with performing arts enterprises, setting up relevant majors according to market demand, such as performance, directing, stage design, and cultural industry management. Optimize course offerings, emphasize practical teaching, establish internship and training bases, provide students with practical opportunities, and cultivate professionals who meet the needs of the performing arts industry's development. At the same time, conduct on-the-job training and continuing education for existing staff to enhance their professional competence.

Increase efforts in talent introduction, formulate preferential policies to attract outstanding performing arts talents and cultural industry management talents from home and abroad to develop in Hainan. Provide guarantees in housing, children's education, and medical care to address the concerns of talents. Encourage well-known performing artists and cultural entrepreneurs to set up studios or companies in Hainan, promoting the growth of local talents and the development of the industry.

### **5.2. Build a characteristic performance brand**

Unearth cultural connotations, delve into Hainan's historical culture, folk culture, and maritime culture, and integrate these distinctive cultural resources into performance creation to build a Hainan-themed performing arts brand. Enhance the cultural value and appeal of performance products through unique cultural expression and artistic innovation. For example, use traditional songs and dances of the Li ethnic group in Hainan, along with folk legends, as material to create large-scale musical dramas with ethnic characteristics, showcasing Hainan's unique cultural charm.

Strengthen brand promotion by formulating comprehensive brand promotion strategies, integrating online and offline promotional channels to enhance brand awareness and influence. Utilize platforms such as the internet and social media for targeted marketing, creating high-quality promotional videos, images, and other content to attract the attention of potential consumers. Participate in cultural industry exhibitions and performance events

both domestically and internationally to showcase the unique features and advantages of Hainan's commercial performance ecosystem, and strengthen exchanges and cooperation with peers at home and abroad.

### **5.3. Deepen the integration of business and performing arts**

Optimize the layout of commercial formats: Based on the characteristics and target audience of performance projects, optimize the layout of commercial formats. Increase sales of cultural and creative products related to performances, themed dining, and distinctive accommodations to form a complete industrial chain. For example, open cafes and restaurants themed around performance IPs in performance districts, introduce unique cultural and creative products, extend customer stay times, and boost consumption growth.

Innovate integration models and explore diverse commercial and performance fusion models, such as hosting commercial activities themed around performances and launching bundled ticket products for both commerce and entertainment. Encourage commercial entities and performance companies to jointly invest in and operate performance projects, achieving shared benefits and shared risks. For example, commercial entities provide venue and financial support, while performance companies handle the planning and operation of performances, working together to create market-competitive performance brands.

### **5.4. Improve infrastructure and services**

Strengthen the construction of performance facilities, increase investment in hardware such as performance venues and stage equipment, to enhance the quality and effect of performances. Build a number of modern, multi-functional performance venues equipped with advanced lighting, sound, and stage machinery to meet the needs of various types of performances. At the same time, improve transportation and parking infrastructure around commercial areas to facilitate travel for audiences and visitors.

Improve service quality, strengthen the service quality management of commercial performance ecological districts, and enhance the professional competence and service level of staff. Establish a comprehensive visitor service center to provide one-stop services, including consultation, guidance, and complaint handling. Strengthen environmental hygiene management to create a clean and comfortable consumption environment, thereby increasing customer satisfaction.

## **6. The enlightenment and reference of the construction of an international urban performance ecosystem**

### **6.1. Focus on the excavation and inheritance of cultural characteristics**

The successful construction of an international urban performing arts ecosystem cannot be separated from the in-depth exploration and inheritance of local cultural characteristics. For example, Broadway in New York, against the backdrop of America's multiculturalism, has created a large number of internationally influential musicals, becoming a benchmark in the global performing arts industry. In the development of commercial performance ecological zones in Hainan, it is essential to fully leverage its cultural advantages, integrating Hainan's unique cultural elements into performance creation and zone development, to create a performing arts ecosystem with distinctive cultural appeal.

### **6.2. Strengthen industrial coordination and innovation development**

The performing arts ecosystem is a complex industrial network that requires collaboration and innovative development among various sectors. The performing arts industry in London's West End is closely integrated with



surrounding industries such as dining, accommodation, and tourism, forming a complete industrial chain. At the same time, it continuously innovates in performance formats and business models, introducing new technologies and concepts to maintain the vitality and competitiveness of the industry. Hainan's commercial performing arts eco-districts should strengthen their integration with tourism, commerce, and cultural creativity industries to promote innovation and upgrading in the performing arts sector.

### **6.3. Strengthen policy guidance and support**

The government's policy guidance and support are crucial for the development of the performing arts ecosystem. Cities like Beijing and Shanghai have attracted a large amount of performing arts resources through a series of policies to promote cultural industry development, increasing fiscal investment, tax incentives, and land support. This has facilitated the rapid growth of the performing arts industry. The Hainan government should further improve its policy system to provide comprehensive policy support for the construction of commercial performing arts eco-districts.

## **7. Conclusion**

The construction of Hainan's commercial performance ecosystem is a significant exploration and practice in building an international urban performance ecosystem. In the development process, Hainan has achieved certain results by leveraging policy support, tourism market potential, and rich cultural resources. However, it also faces challenges such as a shortage of professional talent, insufficient brand influence, and inadequate integration between commerce and performance. By strengthening talent cultivation and introduction, creating distinctive performance brands, deepening the integration of commerce and performance, and improving infrastructure and services, the government can effectively promote the construction of Hainan's commercial performance ecosystem, enhancing its status and influence in the international urban performance ecosystem. At the same time, drawing on advanced international and domestic experiences, focusing on the exploration of cultural characteristics, industrial collaborative innovation, and policy guidance support, will inject strong momentum into the sustainable development of Hainan's performance industry and the construction of an international city, helping Hainan stand out in global cultural industry competition and achieve prosperity in both culture and economy.

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# Is Social Reproduction a Useful Theoretical Lens for Understanding the Relationship Between Education and Career Destinations?

Su Luo\*

66 Gladwin Tower, London SW8 2FA, United Kingdom

*\*Author to whom correspondence should be addressed.*

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**Abstract:** This paper explores the relationship between education and career destinations through the lens of social reproduction theory. Rooted in Marxist thought, social reproduction highlights how social inequalities are perpetuated across generations, particularly through education systems and labour markets. Drawing on studies from both the UK and the US, the paper critically examines how social and cultural capital influence individuals' educational outcomes and career opportunities. It demonstrates how middle-class families leverage networks and cultural resources to secure advantageous positions for their children. The analysis extends beyond class to incorporate gender, race, and ethnicity as critical, intersecting factors. Gendered expectations influence subject choices, work-family balance, and earnings, while race and ethnicity shape access to educational support, employment networks, and job market outcomes — often through mechanisms like racial penalties and white privilege. The paper underscores that while social reproduction is a powerful tool for understanding these dynamics, it must be considered alongside other social dimensions. Ultimately, the paper concludes that the relationship between education and career destinations is shaped by the intersecting effects of class, gender, race, and ethnicity.

**Keywords:** Social reproduction; Cultural capital; Social capital; Educational inequality; Career destinations

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## 1. Introduction

In today's society, the relationship between education and career destinations forms a bridge that shapes both individual trajectories and social structures. Social reproduction theory reveals how social inequalities are transmitted across generations through the education system and labour market. Drawing on various studies from the US and UK, this essay employs social reproduction as a theoretical lens to examine the connections between education and career destinations. Furthermore, by incorporating cases from both countries, this essay may be applicable in a broader context.

Firstly, the essay will critically analyse social reproduction as a useful theoretical lens for understanding the relationship between education and career destinations. This analysis will draw on two key concepts: social capital and cultural capital. The study will then introduce three additional factors that contribute to this relationship: gender, race, and ethnicity. When exploring the relationship between education and career destinations, it is essential to consider how these three factors interact with social reproduction.

## **2. Social reproduction as a useful theoretical lens**

The Marxist understanding of social reproduction involves both the renewal of the labour force and the preservation of class relations. It views this process not only from the perspective of individual workers or firms but also from the broader context of maintaining capitalist structures in society <sup>[1]</sup>. Marx emphasised how culture and customs — referred to as the “superstructure” — play a significant role in either facilitating or impeding social continuity. This superstructure is connected to the economic forces and relations of production, known as the “base”, which both shape and are shaped by the superstructure.

Morrow and Torres argued that seemingly “innocent” yet problematic educational policies and practices — such as market-driven school choice, curriculum reforms, accountability measures, and student enrolment rules — play a role in perpetuating forms of domination and inequality <sup>[2]</sup>. Moreover, Walker asserted that the education system mirrors the workplace in an economic-reproductive model, revealing structural processes within schooling that contribute to social reproduction <sup>[3]</sup>.

### **2.1. Social capital**

The perpetuation of social inequality from one generation remains a persistent issue. Social capital, as a resource unequally distributed across social groups, plays a significant role in this phenomenon. Scholars like James Coleman and Pierre Bourdieu are associated with this perspective. Bourdieu defined social capital as the resources individuals can access through their social networks and connections, encompassing information, support, cooperation, and various forms of assistance that can be activated within social relationships <sup>[4]</sup>. He also highlighted social capital’s tendency to favour those already in privileged positions. Bourdieu argued that individuals from higher social classes often possess more extensive and influential social networks, providing them with greater access to valuable resources <sup>[4]</sup>.

Coleman linked social capital to educational outcomes, emphasising the importance of “closure”, or the mutual nature of relationships <sup>[5]</sup>. In education, a specific form of closure is “intergenerational closure”, where children benefit from their families’ social capital. Horvat et al. also discussed intergenerational closure, suggesting that social capital is built through parental networks — particularly those of middle-class families — throughout a child’s life <sup>[6]</sup>.

More specifically, families with greater social capital can significantly aid their children in successfully completing their education. According to Baker and Stevenson, middle-class parents in the US pass down their social networks to their children, distinguishing them from the working class <sup>[7]</sup>. These parents actively manage their children’s education by investing resources, applying their understanding of the education system, and making informed decisions about educational choices. A similar pattern is observed in the UK, as seen in Ball et al.’s study, which explored how parents with more social capital play a key role in shaping their children’s educational choices <sup>[8]</sup>. Under policies that allow parental school choice, parents assume the role of strategists, with

the primary goal of securing the best possible outcomes for their children. Ball suggested that middle-class parents with social capital have access to a wider array of strategic options, gaining additional insights about schools through their social networks <sup>[9]</sup>. Consequently, these parents may choose schools based on a broader range of information sources, such as the school's reputation and educational practices. In conclusion, when children are born into families with greater social capital, their parents can significantly influence their ability to make well-informed educational choices.

Furthermore, family-based social capital also influences how easily children can secure employment. Specifically, parents with greater social capital can provide their children with an advantage in the job market through referrals. Brown et al. conducted a study comparing outcomes between referred and non-referred workers in the US, examining the likelihood of being hired, initial wages, and turnover rates <sup>[10]</sup>. They found that referred workers are more likely to be hired, and those hired through referrals enjoy higher starting wages and lower turnover rates during their initial three years of employment. It is important to note that these advantages from referrals may primarily benefit individuals within the same network. Consequently, as the hiring process increasingly favours candidates who are referred, individuals outside these networks may face disadvantages. Therefore, children with more family social capital are more likely to secure employment through referrals, thus contributing to inequalities in the job market between themselves and those lacking family social capital.

## 2.2. Cultural capital

Moreover, social inequality is also perpetuated through cultural reproduction. Bourdieu defined cultural reproduction as the transmission of general cultural background, knowledge, dispositions, and skills from one generation to the next <sup>[4]</sup>. The connection between social reproduction and cultural reproduction is symbiotic, as the perpetuation of societal structures (social reproduction) is closely intertwined with the transmission and preservation of cultural elements, as suggested by Bourdieu (cultural reproduction).

Cultural capital, as proposed by Bourdieu, provides a useful concept for analysis <sup>[4]</sup>. There are three key arguments related to cultural capital. Firstly, individuals from different class backgrounds inherit distinct cultural capital. Secondly, schools tend to favour the cultural capital of the dominant class, systematically devaluing that of the lower class. Upper-class students, for instance, gain linguistic and cultural competence through homeschooling, providing them with the tools for success in formal education and converting academic achievement into economic wealth <sup>[11]</sup>. Lastly, children who engage in activities like reading books, visiting museums, attending concerts, and experiencing various cultural events acquire familiarity with the dominant culture, which the education system implicitly requires for academic achievement <sup>[4]</sup>.

Cultural capital is a multifaceted asset encompassing 'embodied, objectified, and institutionalised' forms <sup>[4]</sup>. Embodied cultural capital includes elements like accent, dialect, and posture, while objectified capital consists of material possessions with cultural significance. Institutionalised forms involve formal education degrees, identified by Bourdieu as crucial <sup>[4]</sup>. Bourdieu suggested that formal education perpetuates social inequality through symbolic violence, a means by which dominant beliefs are imposed to maintain power relations <sup>[12]</sup>. This process, distinct from physical force, covertly influences consensus, favouring a specific social group's interests. Educational institutions tend to favour the cultural assets associated with the dominant social class while consistently undervaluing the cultural assets of the lower class. Therefore, symbolic violence, according to Bourdieu, aids in cultural reproduction and transmission of cultural capital, contributing to social inequality <sup>[13]</sup>.

Moreover, MacLeod suggested that under the guise of "meritocracy", academic success is often perceived



as the outcome of personal abilities rather than being truly connected to merit <sup>[14]</sup>. Thus, social reproduction at school is implicit, making it difficult to detect. Instead of considering personal abilities, Bourdieu and Passeron suggested that the success or failure of the school depends primarily on social class <sup>[15]</sup>. This means that children from high-class families with more cultural capital naturally adapt better to schooling and are rated higher. As a result, schooling does not change the gap in cultural capital that exists between the different class families that the students themselves come from, but instead further strengthens inequality. As Bourdieu suggested, schooling entrenches social inequalities by reproducing class privilege and simultaneously sanctifying the inequalities that result <sup>[16]</sup>. In particular, educational qualifications serve as a key mechanism for reproducing social inequalities by shaping individuals' tastes and preferences in ways that reinforce existing power structures.

To understand the relationship between education and career destinations using cultural capital, Bowles and Gintis emphasised that the disparities between schools lead to varied employment prospects for families with different levels of cultural capital <sup>[17]</sup>. They highlight distinct structural differences among schools in the US. Schools serving working-class children, with less cultural capital, tend to be more regimented, focusing on rules and behavioural control, ultimately preparing them for lower-status jobs. In contrast, middle-class children with more cultural capital are encouraged to learn at their own pace, operate independently, and internalise social norms, preparing them for leadership roles rather than subordinate positions. Similar findings can be seen in the UK, as Bourdieu pointed out, the inheritance of cultural capital based on different class origins <sup>[4]</sup>. Certain professions have specific codes of conduct, unwritten rules, and insider knowledge that might not be explicitly taught in educational institutions; cultural capital equips individuals to comprehend and navigate these professional norms.

Friedman and Laurison used the UK Labour Force Survey to provide an extensive analysis of social mobility <sup>[18]</sup>. Their research revealed substantial differences between various occupational groups, particularly within the medical profession. A limited percentage (7%) of doctors come from working-class backgrounds with less cultural capital, while a significant majority (80%) come from privileged backgrounds. Furthermore, individuals from working-class backgrounds face challenges in accessing the UK's top professions, experiencing a substantial "class pay gap" at both senior and junior levels, even when controlling for educational attainment <sup>[18]</sup>. While education does play a partial equalising role when considering a person's educational achievements, it is crucial to note that private schooling is strongly associated with class origins and cultural capital <sup>[19]</sup>.

In summary, cultural capital plays a crucial role in maintaining social inequality. Schools tend to favour children with more cultural capital, preparing those from upper-class backgrounds for top economic positions. Simultaneously, this process conditions lower-class individuals to accept their more modest status in the societal hierarchy.

### **3. Other factors to understand the relationship between education and career destinations**

Whilst social reproduction plays an important role in examining the relationship between education and career destinations, it is equally important to consider gender, race, and ethnicity, as these factors also have significant impacts on education and career outcomes.

#### **3.1. Gender**

Firstly, gender plays a significant role in shaping students' programme choices, leading to variations in enrolment patterns across different specialisations. Zafar pointed out that boys often show a preference for subjects like mathematics, physical sciences, and information technology, while girls frequently choose the humanities and



biological sciences in the US <sup>[20]</sup>. However, Ma argued that girls from lower socio-economic status backgrounds are just as likely as boys to choose a lucrative university programme <sup>[21]</sup>. However, for students from higher socio-economic backgrounds, gender differences persist: female students favour social sciences and humanities subjects, while male students favour business and health subjects in the US.

Saeed highlighted a significant gender disparity, indicating fewer opportunities for girls to enter engineering programmes compared to boys in the UK <sup>[22]</sup>. This imbalance can potentially lead to lower earnings for girls due to the higher income associated with science and engineering fields. Saeed's study further indicates that even after adjusting for factors such as family background, institution type, major, academic performance, and job placement, male graduates consistently receive higher pay than their female peers, regardless of their chosen speciality. Consequently, many female graduates choose to pursue advanced degrees to enhance their future job competitiveness. This trend contributes to the current higher educational attainment of girls compared to boys.

Concerning career destinations, it is essential to examine the division of paid and unpaid work within households. Sayer highlighted that in the US, when women become mothers, societal expectations often position them as primary caregivers rather than primary earners <sup>[23]</sup>. This anticipation of involvement in housework and childcare can adversely impact the career choices, aspirations, and plans of young women <sup>[24]</sup>. Mothers dedicate significant time and energy to caring for their children, limiting their opportunities to pursue paid work. Moreover, Coltrane suggested that men's engagement in parenting activities can lead employers to question their commitment and dedication to paid work in the US <sup>[25]</sup>. Consequently, persistent perceptions of paternalism discourage men from investing more time in unpaid work, contributing to societal inequalities between men and women in both paid and unpaid roles.

Similarly, in the UK, Platt noted that women's educational qualifications may not translate into higher-level occupational positions as they do for men <sup>[26]</sup>. Women entering the paid labour market are more likely to assume childcare responsibilities, and the constraints of family duties often force them into part-time or lower-paid jobs. Hence, gender should be a focal point in discussions about the relationship between education and career destinations.

Nevertheless, it is not enough to understand the relationship between education and career destinations in terms of gender alone. Gender issues and social reproduction are mutually reinforcing, as societal norms and structures related to gender roles play a significant role in the ongoing process of reproducing social inequalities. According to DiMaggio's study, there are significant disparities in the impact of cultural capital on men and women <sup>[27]</sup>. Cultural capital has the most profound effect on the education and career destinations of daughters with college-educated fathers in the US. Cultural capital seems integral to the identity of academically successful middle-class girls. In a world where men dominate careers and control material rewards, women feel a greater need to distinguish themselves through the cultural marketplace.

Elder noted that men from higher-class backgrounds use elite culture as an alternative platform for achievement <sup>[28]</sup>. However, unlike men with high cultural capital striving for workplace success, women with more cultural capital see their academic achievements as qualifying them to be partners with middle-class men. When discussing the relationship between education and career destinations, considering social reproduction and gender together reveals that women from middle-class backgrounds with higher-educated parents use their degree as a criterion for becoming the partners of middle-class men, rather than for success in the labour market. Therefore, considering both factors together provides a more holistic approach to exploring the relationship.

### 3.2. Race

Apart from gender, race also plays a significant role in shaping the connection between education and career destinations. For example, Royster's study revealed disparities in the support provided by white male teachers to black and white males in the US <sup>[29]</sup>. The study noted that these teachers offered verbal encouragement to black students but were more actively involved in assisting white students, providing them with information about job vacancies, referrals, and direct recruitment. Furthermore, crucial employment information and assistance in public school settings are racially privatised, with white male teachers establishing a parallel transition system that benefits white students more than their black counterparts.

Furthermore, some scholars refer to "racial penalties" in the workplace. Heath and McMahon defined "racial penalties" as forms of discrimination related to employment, encompassing factors that lead a racial group to underperform in the labour market compared to similarly qualified white individuals <sup>[30]</sup>. Royster presented two arguments for racial disadvantages in US workplaces <sup>[29]</sup>. One argument suggests that vulnerability in the job market for black individuals is due to fewer desirable work-related cultural practices, making them less attractive to employers. The other suggests implicit differences in the labour market skills possessed by white and black people with similar diplomas, emphasising the perceived inferior skill sets of black individuals. Both perspectives highlight the racial deficit as the cause of black unemployment, framing it as a result of racial perceptions rather than structural inequalities.

Royster's findings reveal that for white males, factors like youth, inexperience, immaturity, and indiscipline do not come at a great cost. However, black men often struggle to remain in the trades they initially learned and are less likely than white men to transition between trades. Once leaving skilled trades, black men tend to enter low-skilled service industries, such as retail or food service. Furthermore, despite achieving similar academic qualifications as white individuals, many occupations maintain an elite status by preserving white identity and privilege, resulting in a higher likelihood of unemployment and low-skilled jobs for black individuals. Thus, race might be a vital factor in discussions about the relationship between education and career destinations.

However, it is also beneficial to understand the relationship by discussing social reproduction and race together. Cancio et al. pointed out that the correlation between test scores and class background suggests that differences observed between black and white individuals on standardised achievement tests reflect class background factors rather than the independent influence of race in the US <sup>[31]</sup>. Furthermore, Liu et al. discovered the close relationship between social class and race in shaping people's education and career destinations <sup>[32]</sup>. They suggested that white middle-class privilege is closely related to self-agency. If they expect to be treated fairly in the work environment, white middle-class people may reflect their ability to "get what they want." Conversely, people of lower social class may expect failure in the same circumstances. Liu et al.'s study further pointed out that white middle-class privilege can be reflected by the lack of consequences for behaviours such as alcoholism <sup>[32]</sup>. They used a case study to illustrate that white middle-class children do not have to worry about their careers and grades at graduation, creating a sense of invulnerability in the white middle class.

### 3.3. Ethnicity

In addition, ethnicity is also a crucial factor in understanding the relationship between education and career destinations. Bhopal's research indicated that while students from black and minority ethnic (BME) backgrounds are increasingly enrolling in higher education in the UK, they are less likely to graduate with a 2:1 or first-class degree <sup>[33]</sup>. Furthermore, Bhopal's study found that BME students, with similar qualifications to their white peers,

are more likely to be unemployed six months after graduation, with lower earnings in the UK.

However, a more holistic understanding of the relationship can be achieved by considering both ethnicity and social reproduction together. Catney and Sabater found that individuals from ethnic minority groups and low socio-economic backgrounds in the UK are less likely to attend prestigious universities or hold higher-status public office later in life <sup>[34]</sup>. Furthermore, Li and Heath used aggregated data from nationally representative British surveys conducted between 1982 and 2011 <sup>[35]</sup>. The inclusion of all major “visible” ethnic minority groups allowed for a much finer-grained analysis than previous studies. Their research found that the strength of the association between first-generation ethnic minority males competing with white males for advantaged class status and avoiding disadvantaged class status remained fairly similar over the first three decades. However, for second-generation males, there was a clear and significant decline in the strength of the association between ethnicity and class affiliation. Therefore, when scholars explore the relationship between education and career destinations, they should consider both social reproduction and ethnicity.

## 4. Conclusion

In conclusion, social reproduction provides a valuable theoretical lens for understanding the relationship between education and career destinations. It offers important insights into the perpetuation of social inequalities, emphasising how socio-economic structures are transmitted across generations, influencing educational opportunities and subsequently shaping career outcomes. However, it is crucial to recognise the limitations of this perspective, as other factors, such as gender, race, and ethnicity, also play significant roles in this relationship. Ultimately, the connection between education and career destinations cannot be fully understood through social reproduction alone but must also consider its intersection with these additional factors.

## Disclosure statement

The author declares no conflict of interest.

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# The Main Problems and Countermeasures Faced by Haikou in Accelerating the Building of a Performing Arts Capital

Xueke Peng\*

Hainan Vocational University of Science and Technology, Haikou 571126, China

*\*Author to whom correspondence should be addressed.*

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**Abstract:** Focusing on Haikou's development strategy to become a capital of performing arts, this paper delves into the main challenges it faces and proposes targeted solutions. By analyzing the current state of Haikou's performing arts market, it highlights shortcomings in policy implementation, market cultivation, resource integration, talent development, and brand building. At the same time, considering Haikou's actual conditions and development needs, this paper explores effective pathways to accelerate the construction of Haikou as a capital of performing arts from multiple dimensions, including improving the policy system, optimizing the market environment, integrating cultural resources, enhancing talent cultivation, and shaping brand images. The aim is to provide theoretical support and practical guidance for the sustainable development of Haikou's performing arts industry.

**Keywords:** Haikou; Performing arts capital; Problems; Countermeasures

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## I. Introduction

As the cultural industry thrives, the performing arts sector, as a vital component of this industry, is gradually becoming a new engine for urban cultural development and economic growth. Haikou, the capital city of Hainan Province, boasts a unique natural environment, rich and diverse cultural resources, and the policy advantages of the Hainan Free Trade Port, providing a solid foundation for establishing itself as a hub for performing arts. In recent years, Haikou has hosted a series of high-profile, internationally influential cultural performances, such as Kanye West's World Tour Auditions and Charlie Puth's World Tour Concerts, attracting a large number of domestic and international audiences and injecting new vitality into the city's performing arts market. However, in the process of building itself into a performing arts capital, Haikou still faces numerous challenges and issues that require in-depth analysis and effective solutions.

## **2. The main problems faced by Haikou in accelerating the building of a performing arts capital**

### **2.1. Policy implementation and improvement**

Despite the Hainan Free Trade Port construction providing a series of favorable policies for Haikou's performing arts industry, such as visa-free entry for personnel from 59 countries and allowing foreign capital to pilot the establishment of performance brokerage agencies in Hainan, there are certain difficulties in implementing these policies in practice <sup>[1-2]</sup>. The detailed implementation rules for some policies are not clear enough, leading to numerous obstacles for enterprises when applying for and enjoying policy benefits <sup>[3]</sup>. For example, during the performance approval stage, although Haikou has implemented a "one-stop" mechanism for large-scale performance activities, the approval process remains insufficiently streamlined and takes a long time, affecting the efficiency of project implementation <sup>[4]</sup>. Moreover, the support policies for introducing internationally renowned performing arts projects and talents need to be further strengthened to attract more high-quality resources to Haikou <sup>[5]</sup>.

### **2.2. Insufficient market cultivation**

The performance market in Haikou is still in its developmental stage, with many shortcomings in market cultivation <sup>[6]</sup>. On one hand, local residents have not fully developed the awareness and habits of consuming performances, resulting in a relatively small audience with limited purchasing power <sup>[7]</sup>. On the other hand, the development of the tourism performance market is insufficient, failing to fully tap into Haikou's rich cultural and tourism resources and deeply integrate performances with tourism <sup>[8]</sup>. Many tourism performance products lack innovation and appeal, making it difficult to meet the diverse needs of tourists <sup>[9]</sup>. Additionally, marketing efforts in the performance market are inadequate, with limited promotional channels, leading to low visibility for some excellent performance projects and low audience recognition <sup>[10]</sup>.

### **2.3. Insufficient integration and utilization of cultural resources**

Haikou boasts rich historical and cultural resources, folk culture, and marine culture. However, in the process of building itself into a capital of performing arts, the integration and utilization of these cultural resources have been insufficient <sup>[11-12]</sup>. There is a lack of effective integration and synergy among different cultural resources, failing to form a distinctive cultural performance brand for Haikou. Some performance projects fail to deeply explore the local cultural essence in their content creation, merely imitating successful cases from other regions, which results in performances lacking uniqueness and appeal <sup>[13]</sup>. At the same time, the integration of cultural resources with the performing arts industry is low, failing to fully leverage the supporting role of cultural resources in the performing arts sector <sup>[14]</sup>.

### **2.4. Shortage of professional personnel**

The development of the performing arts industry cannot do without the support of professional talent. However, Haikou currently faces a shortage of such talent. In terms of creative work, there is a lack of innovative and experienced playwrights and directors, leading to fewer original performances with lower quality <sup>[15]</sup>. Regarding performance, the pool of outstanding actors is relatively weak, with insufficient talent reserves. Moreover, there is also a lack of specialized personnel in areas like operational management and marketing, which hinders the overall development level of the performing arts industry. The talent cultivation system is incomplete, and cooperation between local universities, vocational schools, and performing arts companies is not tight enough, lacking an

effective mechanism for talent training and delivery <sup>[16]</sup>.

## **2.5. Insufficient brand influence**

Despite hosting some internationally influential performing arts events, Haikou still falls short in overall brand influence. Compared to well-known performing arts cities like Beijing, Shanghai, and Hong Kong, Haikou has a significant gap in shaping and promoting its performing arts brand. The lack of representative local performing arts brands makes it difficult for Haikou to secure a place in the national and even global performing arts market. Additionally, Haikou has not done enough to integrate its city image with that of a performing arts capital, failing to fully leverage the city's natural and cultural characteristics to create a unique and charming brand image. Insufficient promotional efforts and a lack of systematic and targeted marketing strategies have led to low awareness and reputation for Haikou as a performing arts capital <sup>[17]</sup>.

## **3. Haikou's countermeasures to accelerate the building of a performing arts capital**

### **3.1. Improve the policy system to ensure the implementation of policies**

Refine policy implementation details; relevant government departments should further refine the detailed implementation rules for various performance industry policies in the Hainan Free Trade Port, clarifying the scope of application, eligibility criteria, and procedures to ensure the operability of the policies. For example, in terms of performance approval, detailed guidelines should be established to specify the processing times and requirements for each stage, thereby improving approval efficiency.

Increase policy support and enhance financial subsidies and tax incentives for the introduction of internationally renowned performing arts projects and talents. Establish a special fund for the development of the performing arts industry to provide focused support for outstanding projects, original works, and talents. At the same time, encourage private capital to invest in the performing arts industry through government-guided funds and other means, attracting more investment into this sector.

Establish a policy evaluation and adjustment mechanism to regularly evaluate the implementation effect of the performing arts industry policy, and timely adjust and improve the policy according to the evaluation results. Strengthen the supervision and management in the process of policy implementation to ensure that the policy is implemented in place and avoid the phenomenon of "hanging" policy.

### **3.2. Strengthen market cultivation and expand the performance consumption market**

Cultivating the local performing arts consumption market: By organizing various cultural activities and promotional events, the government aims to enhance local residents' awareness and interest in performing arts consumption, fostering their habits of engaging in such activities. For instance, hosting free public performances and lectures can help disseminate knowledge about performing arts culture and improve residents' artistic literacy. At the same time, introducing preferential policies for local residents' performing arts consumption, such as ticket discounts and consumption subsidies, can lower the barriers to entry for residents.

Develop the tourism performance market, delve into Haikou's cultural and tourism resources, and integrate them with tourist attractions and routes to create distinctive tourism performance products. For example, in areas like the Rixiang Old Street and the Feng Xiaogang Film Commune at Mission Hills, introduce live performances with historical and cultural characteristics; in seaside scenic spots, develop outdoor performance projects themed around marine culture. Enhance the deep integration of tourism performances with the tourism

industry, incorporate performance projects into recommended tourist routes, and increase the visibility and visitor participation of tourism performances.

Innovate marketing and promotion methods, leveraging emerging channels such as the internet and social media to conduct diversified marketing activities. Produce high-quality promotional videos and posters, widely disseminating them through platforms like TikTok, Weibo, and WeChat; collaborate with online travel and ticketing platforms to launch online booking and marketing campaigns for performance projects. At the same time, organize themed festivals and competitions centered around performances to attract media attention and public participation, enhancing the visibility and influence of the performance market.

### **3.3. Integrate cultural resources and create characteristic performance brands**

Strengthen the integration of cultural resources: Conduct a comprehensive review and integration of Haikou's historical culture, folk culture, and maritime culture to establish a cultural resource database. Break down barriers between different cultural resources to promote collaborative innovation and integrated development. For example, combine the culture of Hai Rui, the culture of Lady Xian, with Hainan's folk culture to create performance works rich in cultural connotations.

Delve into the cultural essence, encouraging performing arts creators to explore the depth and uniqueness of Haikou's local culture. With a unique cultural perspective and innovative presentation techniques, they should craft performance brands that reflect Haikou's characteristics. In content creation, focus on combining storytelling with entertainment value, integrating elements such as regional features, folk customs, and aesthetic arts, making performance works more appealing and engaging.

Promote the integration of culture and the performing arts industry, enhancing the deep integration of the cultural and performing arts industries. Encourage cultural enterprises to participate in the investment, production, and operation of performance projects. At the same time, integrate the performing arts industry with other related sectors such as catering, accommodation, and shopping, forming a complete industrial chain. For example, develop cultural and creative districts and specialty dining streets around performance venues, providing audiences with a one-stop cultural consumption experience.

### **3.4. Strengthen talent training and improve the quality of talent**

Improve the talent cultivation system, strengthen cooperation between local universities and vocational colleges with performing arts enterprises, establish internship and training bases, and jointly develop talent cultivation plans. Offer majors related to performing arts in universities and vocational colleges, such as performance, directing, stage design, and performance management, to cultivate professionals who meet market demands. At the same time, encourage enterprises to conduct internal training and continuing education to enhance employees' professional skills and expertise. Introduce high-end talent, formulate preferential policies, and attract outstanding performing arts talents from home and abroad to develop in Haikou. Through talent introduction programs, provide high-end talents with housing, children's education, medical care, and other guarantees to address their concerns. For example, offer housing subsidies, talent apartments, and other preferential policies to well-known screenwriters, directors, actors, and other high-end talents introduced, to attract them to work in Haikou.

Strengthen talent exchange and cooperation, actively carry out domestic and international talent exchange and cooperation activities, and invite renowned performing arts experts and scholars from home and abroad to Haikou for lectures, training, and guidance. At the same time, encourage local performing arts talents to participate in domestic and international performance competitions and exchange activities, broaden their horizons and thinking,



and enhance their professional level and international competitiveness.

### **3.5. Enhance brand influence and shape the image of urban performance**

To build local performing arts brands, the government needs to increase the cultivation and support for these brands, encouraging performing arts companies and creators to develop representative brands. By organizing brand selection events and showcasing high-quality productions, the government can enhance the recognition and reputation of local performing arts brands. For example, creating a large-scale musical brand based on Haikou's historical and cultural background, through continuous performances and promotional efforts, making it a hallmark of Haikou's performing arts.

Strengthen the integration of Haikou's city image with its brand as a performing arts capital, organically combining the city's natural and cultural characteristics to create a unique and charming brand for the performing arts capital. In urban planning and development, incorporate performance elements such as building performance theme parks and cultural squares to foster a rich atmosphere of performance culture. At the same time, enhance Haikou's reputation and influence in the international performance market by hosting international performance festivals, competitions, and other events.

Strengthen brand promotion and develop systematic and targeted strategies for brand promotion, increasing publicity efforts for Haikou as a city of performing arts. Utilize platforms such as mainstream media at home and abroad, tourism fairs, and cultural exchange activities to widely promote Haikou's performing arts resources and brand image. Produce high-quality promotional materials, such as videos and brochures, to showcase the charm of Haikou as a city of performing arts to domestic and international tourists and professionals in the performing arts industry. At the same time, enhance cooperation with domestic and international performing arts institutions and media, and organize joint promotional activities to boost the brand recognition and reputation of Haikou as a city of performing arts.

## **4. Conclusion**

Haikou's accelerated development as a performing arts capital holds significant strategic importance and potential for growth, yet it faces numerous challenges and issues in the process. By implementing a series of measures such as improving policy frameworks, enhancing market cultivation, integrating cultural resources, strengthening talent development, and boosting brand influence, Haikou is expected to overcome these challenges and achieve rapid development in the performing arts industry, aiming to create an internationally influential performing arts capital. In future development, Haikou should fully leverage its advantages, seize the opportunities presented by the Hainan Free Trade Port construction, continuously innovate and explore, and promote deep integration between the performing arts industry and other sectors like culture, tourism, and economy, injecting new momentum into the city's sustainable development. At the same time, the government, enterprises, and all sectors of society should work together, forming a united front to foster a favorable environment for the development of the performing arts industry, contributing to the construction of Haikou as a performing arts capital.

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# Driving Brand Synergy: A Discourse-Historical Approach to Western Media Coverage of Lewis Hamilton's Ferrari Transfer

Jiahe Liu\*

University of Leeds, Leeds LS2 9JT, United Kingdom

*\*Author to whom correspondence should be addressed.*

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**Abstract:** As one of the most accomplished drivers in Formula 1 history, Lewis Hamilton's decision to leave Mercedes and join Ferrari in early 2024 is not only a turning point in his personal career but also the most talked-about business event in F1 in the past decade. Based on the Discourse-Historical Approach (DHA) perspective, the research examines the application of the "five discursive strategies" from 91 reports on Hamilton's transfer in Western media between February 2024 and March 2025. Besides, the study employed the methodology of "four levels of contexts" to examine the ideology reflected in Western media narratives and to summarize the underlying factors — the commercialization trend of F1 and the resonance of drivers and teams' brand power. The study provides inspiration for the interdisciplinary application of DHA in sports communication research and athlete discourse analysis.

**Keywords:** Formula 1; Lewis Hamilton; Discourse-Historical Approach; Discursive strategies; Ideological narrative

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## 1. Introduction

Formula 1, as one of the world's top sports events, has undergone a profound transformation from a competitive sport to a commercial one since the 21st century. After the Liberty Media Group took over the commercial operation of F1 in 2017, the sport's commercial value and media exposure have grown exponentially due to capital injection, international brand sponsorship and the rise of digital media: In 2024 season, the number of F1 viewers worldwide exceeded 2 billion, and social media interaction increased by 35 percent year-on-year<sup>[1]</sup>. As a result, optimizing drivers' media narratives has become a core part of F1's brand strategy.

Lewis Hamilton is the only Black driver in F1 history and the second seven-time world champion after Michael Schumacher. During his nearly 20-year career, he helped Mercedes win the constructors' championship for 8 consecutive seasons (2014–2021), while Mercedes' old rival, Ferrari, missed the title for 16 years (2009–2024)<sup>[2]</sup>. Therefore, Hamilton's transfer will break Mercedes' monopoly and ignite the hopes of Ferrari's revival.

Additionally, Hamilton's cross-over effects in charity and fashion have made him a convergence point of sports, philanthropy, and popular culture, and the heated discussion about his transfer reflects the strong public image tension of star athletes in the new media era.

The questions discussed in this study include (1) What discursive strategies did the Western media use to report on Hamilton's transfer? (2) What ideology does the narrative reflect? (3) What is the motivation behind it? From the perspective of DHA, the study conducts a critical analysis of the above research questions using the methodology of "five discursive strategies" and "four levels of context." Overall, the results of this study are expected to expand the application of DHA in the field of sports communication and promote the practice of the DHA research paradigm in the discourse analysis of star athletes.

## 2. Literature review

Sports media narrative has long been regarded as a dual coding system of "competitive heroism" and "commercial rationalism", which was also prominent in F1 <sup>[3]</sup>. The Ferrari driver Michael Schumacher created an unprecedented "red myth" by winning the driver and constructor's championship for five consecutive seasons from 2000 to 2004, while the media exaggerated Schumacher's technical authority through "legendary narratives" <sup>[4]</sup>. In 2018, Hamilton's collaboration with American clothing brand Tommy Hilfiger was also portrayed by the media as a symbol of luxury consumption <sup>[5]</sup>. While traditional sports such as ball games often present a binary narrative of "loyalty-betrayal" in athlete transfer coverage, the uniqueness of F1 lies in its strong correlation between driver skills and car performance makes transfer decisions more likely to be seen as technically rational choices <sup>[6]</sup>. For example, when Sebastian Vettel moved from Red Bull to Ferrari in 2015, the media emphasized "technical potential of the Red team" and downplayed the driver's personal emotional factors <sup>[7]</sup>.

Moreover, the infiltration of implicit ideology in sports coverage cannot be ignored, and identity tags such as race and age often serve as tools for media framing. Hamilton's Black driver identity is a contradictory unity, and he is often depicted by Western media as a "pioneer in breaking racial barriers", but his call for one-knee kneeling on the track to fight against racism is often questioned by conservative media as a "political overstep" <sup>[8-9]</sup>. Similarly, media articles about older athletes often swing between "hero twilight" and "evergreen legend" strategies, such as reports on the later stages of NBA star Vince Carter's career that reflect the contradiction in the narrative of star athletes' ages <sup>[10]</sup>. However, while these literatures offer a theoretical reference for analyzing Hamilton's "race-age" identity, existing studies have not systematically discussed the narrative strategies for older drivers' transfers, nor have they touched upon the cross-influence of identity politics and commercialization.

The Discourse-Historical Approach (DHA) proposed by Ruth Wodak in the 1990s is an important branch of Critical Discourse Analysis (CDA). The core argument is that discourse is not only a reflection of social reality, but also a tool for constructing power relations and ideology <sup>[11]</sup>. Compared with the static perspective of traditional discourse analysis, DHA emphasizes diachronic research and advocates revealing the historical, political, and cultural motivations behind discourse through "five discursive strategies" and "four levels of contexts." The application of DHA has expanded from political discourse in media to corporate advertising and multimodal text on social media, but its practice in sports communication studies is still in the exploratory stage <sup>[12-13]</sup>.

Wang et al. studied the application of DHA in the image building and narrative strategy of players in NBA television broadcasts, conducted quantitative analysis of video framing, camera movement, subtitles, etc. using SPSS tools, and explored the evolution of ideology in combination with historical cases, summarizing the heroic

narrative and dream-chasing culture in NBA broadcasts <sup>[14]</sup>. However, the study's corpus was limited to the broadcasting of 5 games in the 2017 season, resulting in an insufficient sample size, and the research subjects did not go beyond the traditional star players. Jenkel's study combines DHA with gender theory, delving into how patriarchy restricts women's participation in sports through power structures <sup>[15]</sup>. The interdisciplinary analytical framework offers a fresh perspective on the image of female athletes throughout sports history. However, the study focused on the coverage of the female community in English football in the early 20th century, and its universality was limited by the project and era.

In conclusion, the research aims to construct a three-dimensional analytical framework of “identity-age-business” to reveal how F1 media narratives reconcile drivers' personal branding with the commercialization needs of the event through “five discursive strategies”, and to use “four levels of contexts” to relate textual features to the macro context of F1's globalization and capitalization. Ultimately, the study provides a new theoretical lens for understanding the power operation mechanism of the media in noble sports such as motorsport.

### 3. Theoretical framework

In recent years, related research on DHA has been further combined with corpus technology to explore multimodal discourses such as social media texts and corporate identity narratives. In addition, the application of cross-media intertextual comparison enriches the interpretation of the relationship between discourse and society <sup>[16]</sup>. In practice, DHA mainly employs the methodology of “five discursive strategies” and “four levels of contexts” for multi-dimensional analysis to overcome the static limitations of traditional discourse studies (**Tables 1 and 2**).

**Table 1.** “Five discursive strategies” of DHA

Nomination strategy	Construct social actor identities through classification and reference (e.g., pronouns, proper nouns)
Prediction strategy	Endow social actors with positive or negative characteristics (e.g., adjectives, verbs, modal verbs)
Argumentation strategy	Rationalize the argument through the topic
Perspectivization strategy	Convey a specific perspective through direct or indirect quotes, reporting verbs
Intensification or mitigation strategy	Strengthen or weaken the force of the speech through adverbs, modal verbs, etc.

**Table 2.** “Four levels of contexts” of DHA

Immediate linguistic and textual environment	Lexical and sentence structure analysis within the text
Intertextuality and interdiscursivity	The connection between texts and discourses
Externality	Factors outside of language, specific contexts
Social, political, and historical macro context	The social attitudes towards the subject of study, historical significance, etc.

The author suggests that the advantages of DHA can be fully demonstrated in the course of this study. Its critical perspective can expose the ideology implied in Western media discourse, and the diachronic dimension can link the development of F1 globalization and commercialization with the interaction of driver image construction. Besides, the interdisciplinary nature of the research is the focus of integrating linguistic text analysis and sociological power criticism, which provides a systematic framework for decoding the social and cultural motivations behind media discourse.

## **4. Methodology**

### **4.1. Research design**

This study employs the CDA method of qualitative research from the perspective of DHA and conducts a comparative analysis of discursive strategies and ideologies presented in the collected corpus texts to answer the three research questions presented in the introduction.

### **4.2. Data collection**

Given that the working language of F1 is English, reports in English media can enhance the empirical nature of the corpus. Therefore, the author selected four media outlets as data sources for this study: Sky Sports, ESPN, The Guardian, and The New York Times. Sky Sports and ESPN are professional sports media and the official partners of F1 in Britain and America. As leading comprehensive newspapers, The Guardian and The New York Times boast substantial circulations and readership numbers, exerting significant influence among Western audiences.

The corpus texts collected in this study are all from online articles published by the four media outlets. Firstly, the author uses the advanced search of Google News and limits the time range from February 1st, 2024 (Hamilton announced his transfer to Ferrari) to March 31st, 2025 (up to the 2025 Chinese Grand Prix). Secondly, type “Lewis Hamilton to Ferrari” in the search box and perform four sets of searches with the “site” operator to obtain all relevant texts from the four media websites, respectively. Thirdly, the LexisNexis will be used for a second collection of data. The time range, search criteria, and media sources will remain consistent with the previous settings to ensure the completeness of the corpus. Finally, finish the corpus collection after eliminating invalid texts like duplicate articles, reprinted articles, and grade announcements.

### **4.3. Data analysis**

This study qualitatively analyzed the collected data based on the DHA proposed by Vodak and introduced AntConc to meet the corpus coding requirements in the actual operation of DHA. The author encoded the texts using the “media-time” format and generated four groups of classified data, which were imported into AntConc for corpus construction.

In addition, the KWIC and File View tools provided by AntConc significantly enhanced the efficiency of the analysis. By entering keywords such as “Hamilton” and “Ferrari”, not only can relevant texts be rapidly retrieved, but also their co-occurrence within specific contexts can be systematically examined. Subsequently, this study will conduct a critical analysis of the materials under the guidance of “five discursive strategies” and “four levels of contexts” methodology to explore the discursive strategy choices and ideological narratives within them, and summarize the underlying motivations. Overall, the dual search approach adopted in data collection and the DHA research paradigm employed in discussion can ensure reliability, accuracy, and consistency in the analysis process.

## **5. Results and analysis**

### **5.1. Discursive strategy choices by Western media**

#### **5.1.1. Nomination strategy**

Nomination strategy is the use of language to refer to social actors, phenomena, events, and processes. This section focuses on the use of indicative words in the corpus text and the choice of athlete referencers.

In an interview this week with Time Magazine, (1) “The seven-time world champion — the only Black driver in the history of the sport — dismissed criticism the move has generated from the likes of former F1 boss Bernie



Ecclestone” (February 28, 2025, ESPN) <sup>[17]</sup>.

It can be seen from the report excerpted in Example (1) that ESPN first used “the seven-time world champion” for reference, emphasizing Hamilton’s outstanding achievements in F1; the reporter then inserted “the only Black driver” to indicate Hamilton’s ethnicity, highlighting his unique identity among the active drivers. This progressive nomination strategy was used to compare Hamilton to the former F1 president Bernie Ecclestone, who is an old white man. Bernie was pessimistic about Hamilton’s decision to move to Ferrari, and Hamilton refuted his criticism. In other words, the nomination strategy used in example (1) emphasizes Hamilton’s irreplaceable position in F1 in support of his resistance to racist remarks.

(2) “Don’t ever compare me to anybody else... I’m the first and only Black driver that’s ever been in this sport... I’m built different... I’ve been through a lot... I’ve had my own journey,” he said... “You can’t compare me to another 40-year-old, past or present, Formula One driver in history... Because they are nothing like me... I’m hungry, driven, don’t have a wife and kids... I’m focused on one thing, and that’s winning... That’s my No.1 priority.” (February 27, 2025, The Guardian) <sup>[18]</sup>.

Example (2) from The Guardian’s exclusive interview with Hamilton, in which he describes himself as “the first and only Black driver”, expressing his identification with his unique identity. In response to the decline in form among older drivers, Hamilton considers himself different from other “40-year-old” drivers, and the consecutive use of the first-person pronoun “I” in the context emphasizes Hamilton’s emotions towards his identity as a Black driver and explains his confidence in competitiveness. In a word, the personal pronouns employed in Example (2) portray Hamilton’s image as a “tough Black veteran”, and such a nomination strategy also reflects the reporter’s recognition of that image.

### 5.1.2. Prediction strategy

Prediction strategy refers to the use of verbs, adjectives, and modal verbs to express positive or negative emotional tendencies in writing, thereby shaping social actors into the corresponding images.

(3) “He retains the unshakeable belief that he still has what it takes to win a record-breaking eighth world championship, even at 40 — attempting to achieve that with Ferrari, F1’s most legendary team with an unparalleled legacy, ramps up the anticipation.” (March 12, 2025, New York Times) <sup>[19]</sup>.

The prediction strategy in Example (3) relies on the verb “achieve,” which gives Hamilton a positive and active quality. The word literally means “to reach a goal through effort, technique, or courage”, and thus portrays an aggressive image of Hamilton. Besides, the phrases “unshakeable belief” and “even at 40” that the reporter used before convey Hamilton’s unwavering and tenacious attitude towards the challenge of age.

(4) “This is a breathtaking and exhilarating deal... Having signed a new deal with Mercedes in August last year, and after years of repeatedly denying rumours of a move to Ferrari, the 39-year-old has declared his intent to finish his career with the most famous, most storied and most successful team in F1 history.” (February 2, 2024, The Guardian) <sup>[20]</sup>.

The continuous use of adjectives is an effective way to implement the prediction strategy. The adjectives “breathtaking” and “exhilarating” at the beginning of Example (4) describe the significance of Hamilton’s transfer to Ferrari and set the emotional tone for the report. The three superlative adjectives at the end, “most famous”, “most storied”, and “most successful” form a parallelism, and stress again Hamilton’s move to Ferrari was an unprecedented collaboration in F1 history with extraordinary significance. The reporter uses a progressive prediction strategy to push the reader’s positive emotions to a climax step by step.

### 5.1.3. Argumentation strategy

Argumentation strategy is often seen when the writer discusses a certain topic and explains a certain point in the course of writing, thereby leading readers to believe in the rationality of the writer's perspective.

(5) "The difficulty of his debut will not take the sheen off a move that has revitalized the seven-time world champion." (March 18, 2025, New York Times) <sup>[21]</sup>.

The 2025 Australian Grand Prix was Hamilton's first race in Ferrari, the circuit conditions were extremely harsh due to the bad weather. Hamilton finished in tenth place after the race and failed to achieve his initial goal. The noun "difficulty" in Example (5) indicates the fact that Hamilton's Ferrari debut was not going well, which contrasts with the sentiment conveyed later: despite the difficulties and not-so-optimistic results of Hamilton's first race with Ferrari, this did not dampen his enthusiasm for seeking victory as the seven-time world champion. The reporter uses an argumentation strategy to illustrate that Hamilton's loss in his first race at Ferrari does not mean that he cannot accomplish his ambition of winning the championship, nor does it destroy the confidence of the seven-time world champion.

(6) "The seven-time world champion is joining a team that can boast a record 243 wins from 1,076 grands prix. Given that his personal tally is 103 wins from 332 starts, also a record, Hamilton is unlikely to be overawed by the statistics." (February 3, 2024, The Guardian) <sup>[22]</sup>.

Example (6) lists the four numbers "243", "1076", "103", and "332" respectively to quantify the achievements of Ferrari and Hamilton in F1, conveying The Guardian's view that Ferrari's signing of Hamilton was a powerful alliance. The numbers make the argumentation strategy more accurate, scientific, and specific, allowing readers to fully understand the historical status of Ferrari and Hamilton in F1, and thereby enhancing the persuasiveness of their collaboration.

### 5.1.4. Perspectivization strategy

Perspectivization strategy typically employs specific perspectives and language markers such as reporting verbs, direct or indirect quotations, to reproduce the positions of social participants and allowing readers to understand from different perspectives.

(7) "However, speaking in Las Vegas on Wednesday, Hamilton revealed that in the moment he was genuinely ready to call time on his 12-year spell with Mercedes." (November 21, 2024, Sky Sports) <sup>[23]</sup>.

Hamilton admitted before the Las Vegas Grand Prix that he seriously considered ending his partnership with Mercedes with only three races left in the 2024 season. This is because the car was difficult to drive in rainy conditions during the last Brazilian Grand Prix, leaving Hamilton in only tenth place in the end, a torment that has become one of the reasons for his intention to leave the team early. In Example (7), Hamilton's remarks were related indirectly through the reporting verb "reveal", and this perspectivization strategy suggested that his opinion had a secret nature, as well as a potential conflict between Hamilton and Mercedes towards the end of his contract.

(8) "I already knew from the outside how passionate the Ferrari family is, from everyone in the team to the tifosi," Hamilton said. "To now witness it firsthand as a Ferrari driver has been awe-inspiring. That passion runs through their veins and you can't help but be energized by it." (January 25, 2025, New York Times) <sup>[24]</sup>.

Hamilton made his first test drive of Ferrari's F1 car in January 2025, and spoke about his true feelings as a Ferrari driver after the test drive, saying that the enthusiasm of the Ferrari family influences everyone in the team all the time. The reporter used a direct quote led by "said" to describe Hamilton's remarks, reflecting his respect for the Ferrari's culture and his sense of belonging as one of the members. Example (8) illustrates the application

of direct quotes in the perspectivization strategy, which builds an emotional connection between the reader and Hamilton while enhancing the authenticity and presence of the discourse.

### **5.1.5. Intensification or mitigation strategy**

Intensification or mitigation strategy refers to the discursive strategy of using adverbs, modal verbs, etc., to modify the speech in order to increase or decrease the reader's attention.

(9) "If he were to succeed, he would not only become the first eight-time champion in the sport's history, but also the only driver other than five-time champion Juan Manuel Fangio to win titles with three different teams." (February 1, 2024, ESPN) <sup>[25]</sup>.

Example (9) is the prediction of Hamilton's future career made by ESPN on the day he announced his transfer to Ferrari, and the adverb "only" emphasizes the unique achievements Hamilton might make. This is the intensification strategy employed by the reporter, which drew readers' attention to Hamilton's transfer, raised their expectations of his joining Ferrari, and reinforced the positive significance of the event.

(10) "After the loss of several big-name engineers in recent years, Mercedes attempted to strengthen its position in January... In theory, such commitments should have installed extra hope in Hamilton, so it is slightly surprising, or perhaps telling, that he still signed his post-2024 future away to Ferrari before Mercedes had turned a wheel this year." (February 1, 2024, ESPN) <sup>[25]</sup>.

Example (10) points out that Hamilton's transfer to Ferrari really surprised Mercedes, but the modification of the adverbs "slightly" and "perhaps" emphasizes that the degree of surprise is not intense and quickly turns into a self-evident fact, which reflects the mitigation strategy adopted by ESPN. Although Mercedes was eager to make a comeback after the resignation of several well-known engineers in succession, this was not enough to shake Hamilton's determination to move to Ferrari. In other words, the personnel changes at Mercedes have set the stage for Hamilton's departure from the team, which is quite understandable.

## **5.2. The ideology in Western media's narratives**

The previous analysis explores the first research question in the context of "five discursive strategies", namely the discursive strategy choices of Western media in reporting on Hamilton's transfer. This section is dedicated to addressing the second and third research questions, using the methodology of "four levels of contexts" to discuss the ideology and underlying motivations in Western media narratives.

### **5.2.1. Defending Hamilton's form in his advanced age transfer**

F1 is one of the most physically demanding sports, with drivers having an average heart rate of around 160 beats per minute during the race and having to stay focused for about 90 minutes. In addition, drivers' necks have to withstand the huge pull of lateral acceleration during high-speed cornering, as well as the high temperatures from the cockpit and fireproof suits. Age is a key indicator of drivers' physical condition, which can directly affect their competitive state. Although F1 does not limit drivers' maximum age to compete, the peak years of their career are generally between 20 and 40 years old <sup>[26]</sup>. Drivers over 40 will face a decline in form due to a decrease in physical fitness.

(11) "Ferrari's newest recruit Lewis Hamilton has looked to allay any fears about his age ahead of the 2025 Formula 1 season, insisting he will 'never be an old man'." (February 27, 2025, ESPN) <sup>[27]</sup>.

Hamilton will be exactly 40 when he officially joins Ferrari, and the issue of his age naturally draws the

attention of Western media. Example (11) shows that in the immediate linguistic and textual environment, Western media have straightforwardly expressed Hamilton's attitude towards his efforts to allay public concerns about his age. At the end of the passage, the quote "never be an old man" originates from Hamilton himself, further conveying a positive message to readers about his strong and enduring form.

(12) "Hamilton has often spoken of Tom Brady being an inspiration for him, and the Brit has somewhat followed in the footsteps of the legendary NFL quarterback by making a late-career change. After 20 years with the New England Patriots, during which he led the franchise to six Super Bowl victories, a then 42-year-old Brady took his talents to the Tampa Bay Buccaneers." (March 20, 2024, Sky Sports) <sup>[28]</sup>.

Example (12) presents the Western media's view on Hamilton's age under intertextuality and interdiscursivity. Hamilton stated that Tom Brady is the role model he aspires to emulate. Brady facilitated the Tampa Bay Buccaneers' victory in the Super Bowl within just one season of joining the team, demonstrating that seasoned athletes can continue to make significant contributions even after transferring to new teams later in their careers. Sky Sports compared the two legends and noted that Brady's announcement of the move at "42-year-old" was actually based on the view that an advanced age move is not enough to affect Hamilton's title race.

### **5.2.2. Emphasizing the commercial nature of Hamilton's partnership with Ferrari**

As a seven-time world champion, Hamilton no longer needs to prove his standing in the drivers' transfer market. However, as a world-class public figure, Hamilton's value in fashion and philanthropy is not to be underestimated: for instance, he donated £20 million in 2021 to establish the Mission 44 Foundation to support minority education and employment, especially in racing, to create opportunities for the Black community <sup>[29]</sup>.

In the 75-year history of F1, Ferrari has been the most famous, most participated, and most accomplished team, almost becoming the spiritual totem of the sport <sup>[22]</sup>. Meanwhile, as a globally renowned car brand and luxury, Ferrari naturally has a place in the international fashion world. As a result, the commercial nature of Hamilton's partnership with Ferrari have become one of the focal points for Western media coverage.

(13) "Hamilton and Ferrari knew what they were getting with one another, sharing a commercial and cultural relevance that only enhanced their respective standings. They knew the first pictures of him, posed outside Enzo Ferrari's farmhouse, would go viral. Even those with the most basic F1 knowledge would know what Hamilton racing for Ferrari means for the sport." (March 12, 2025, New York Times) <sup>[19]</sup>.

Example (13) is Hamilton's first day at Ferrari's headquarters. The first photo he took outside the farmhouse of the team founder, Enzo Ferrari, quickly went viral online, marking the official start of their collaboration. "Posed outside" and "go viral" reflect the externality in Western media narratives under specific circumstances, while "commercial relevance" expresses Western media's focus on the commercial nature of the transfer. It is believed that even the general public, who may not be familiar with F1, can grasp the commercial significance of this collaboration.

(14) "Hamilton after two winless seasons, made his decision to leave even before the team had finished bolting his 2024 car together. In George Russell, Hamilton's current teammate who also signed a contract until 2025, Mercedes always had something of a succession plan in place, but replacing the commercial appeal of a name known around the world, such as Hamilton's, is a seemingly impossible task." (February 1, 2024, ESPN) <sup>[25]</sup>.

Because of a major change in F1 technical rules, the cars of Mercedes no longer have the dominance as in previous seasons. Hamilton failed to win a single race during the 2022–23 season, which was a direct reason for his decision to leave Mercedes. Example (14) discusses Hamilton's transfer in a macro historical context, pointing



out that Mercedes had a plan to select Hamilton's successor, but it was delayed because Hamilton's "commercial appeal" could bring considerable sponsorship and prestige to the team, which reflects the reporter's recognition of Hamilton's commercial value.

In summary, when Western media reported Hamilton's transfer to Ferrari, they were most concerned about his age and the impact of their partnership on global business operations. The Western media's perspective is to affirm Hamilton's plan of "transferring at an advanced age for seeking world champion", while also praising this transfer as a model of commercial cooperation, which forms the ideological tone of the narrative. However, the underlying motivation is that F1 has faced multiple challenges, including accelerated commercialization, updated technical rules, drivers' generational changes, and expansion of audience, forcing it to maintain its competitiveness in the commercial sports market by rebranding star drivers and teams. Hamilton's personal brand value and Ferrari's brand effects are the two trump cards for F1 in terms of commerce, and their partnership undoubtedly injected strong impetus into enhancing F1's influence in international commercial sports.

## 6. Discussion and conclusion

The findings of this study reveal a mutual relationship between media discursive strategies, ideological narratives, and the commercial imperatives of Lewis Hamilton's transfer to Ferrari. As for "five discursive strategies", the nomination and predication strategies consistently emphasize his dual identity as "Black" and "veteran" that framing his career move as a historic convergence of sporting ambition and commercial synergy, which expands its scope to motorsport's context where technological prowess and team legacy are integral to personal branding. Additionally, the argumentation strategy employing statistical comparisons (Example 6) reveals how Western media created a persuasive framework for unprecedented career moves.

By "four levels of contexts", Western media's defensive narratives around Hamilton's age (Example 11–12) mirror broader societal debates about athlete longevity in high-intensity sports, but introduce an intertextuality dimension to Tom Brady. This comparative framing in F1's context, where the technology often overwhelms individual athleticism, challenges the traditional reference of age-related performance decline in sports media studies. The ideological emphasis on commercial collaboration (Examples 13–14) exposes F1's direction by contextualizing the transfer within macro commercialization trends. Therefore, Western media's narratives position Hamilton-Ferrari as a symbiotic brand alliance rather than mere sporting cooperation. This reflects "media capital" accumulation, where athlete narratives become vehicles for expanding sport's market reach into luxury and lifestyle sectors<sup>[30]</sup>.

The study establishes that Western media narratives surrounding Hamilton's transfer function as both a reflection and driver of F1's commercial evolution. Through the comprehensive application of five discursive strategies and four levels of context, Western media reconciles Hamilton's Black attributes and veteran identity with his marketability, positioning the transfer as a milestone in sports-business convergence. The findings confirm that the coverage of F1 increasingly serves dual purposes: maintaining the legitimacy of drivers' participation through narratives of achievements while advancing commercial objectives through calculated brand publicity.

Future research could extend the application of DHA's paradigm to analyze media narratives surrounding the younger drivers' brand-building strategies or examine how non-Western media interpret Hamilton's transfer within local motorsport markets. Additionally, longitudinal studies tracking post-transfer brand valuation changes could quantify discourse's commercial impacts, further bridging critical discourse analysis with sports marketing analytics.



## Disclosure statement

The author declares no conflict of interest.

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# A Study on the Current Status of Well-being among Ethnic Minority University Students in Yunnan from the Perspective of Positive Psychology

Tian Sun<sup>1\*</sup>, Rongrong Zhang<sup>1</sup>, Yiyang Zhang<sup>2</sup>

<sup>1</sup>Yunnan Technology and Business University, Kunming 650000, Yunnan, China

<sup>2</sup>Civil Aviation Management Institute of China, Beijing 100102, China

*\*Author to whom correspondence should be addressed.*

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**Abstract:** As positive psychology has gained prominence, well-being, as a core indicator of mental health, has increasingly attracted the attention of the academic community. Ethnic minority university students (EMUS) in Yunnan, as a special group, may experience unique influences on their well-being due to their cultural backgrounds and social adaptation processes. This study employed a well-being scale based on the PERMA model to investigate the current status of well-being among EMUS in Yunnan. The findings revealed that the majority of EMUS rated their overall well-being highly. Compared with Han ethnicity university students, EMUS scored significantly higher in the dimensions of relationships and overall well-being, but showed no significant differences in positive emotion, meaning, engagement, and achievement dimensions. In terms of gender differences, EMUS exhibited no significant differences in positive emotion, relationships, meaning, and overall well-being between genders, but males scored significantly higher than females in the dimensions of engagement and achievement. Additionally, no significant differences were observed in the dimensions of well-being across different educational levels and grades.

**Keywords:** Positive psychology; Ethnic minority university students; Well-being

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## 1. Introduction

With the rapid development of higher education in China, the proportion of ethnic minority university students (EMUS) in the higher education system is continuously increasing. Yunnan, one of the provinces with the most ethnic minorities in China, boasts rich ethnic cultural resources and a diverse educational environment. However, EMUS face unique challenges and pressures in their pursuit of academic and career development, which may significantly impact their well-being <sup>[1]</sup>. Positive psychology, as a discipline that studies positive psychological

qualities and happy lives in humans, provides a new perspective for understanding the well-being of EMUS. In recent years, positive psychology has been widely applied in research on the mental health and well-being of university students, but studies focusing specifically on EMUS remain relatively scarce. This study focuses on EMUS in Yunnan, aiming to reveal their current well-being status through empirical research from the perspective of positive psychology.

## **2. Literature review**

Positive psychology, an emerging branch of psychology since the late 20th century, has gradually attracted widespread attention from the academic community. Unlike traditional psychology, which focuses on psychological problems and pathology in humans, positive psychology emphasizes the study of positive qualities, strengths, potentials, and well-being in humans, aiming to promote individual comprehensive development and mental health <sup>[2]</sup>.

### **2.1. Definition and measurement of well-being**

Well-being, as an important research area in positive psychology, has always been a focal point for scholars. Well-being is generally divided into subjective well-being (SWB) and psychological well-being (PWB). SWB is an individual's comprehensive assessment of their quality of life based on their own life standards <sup>[3]</sup>. PWB refers to a state of life in which individuals seek true meaning and can cope with difficulties while striving to realize their inner beliefs <sup>[4]</sup>.

Martin Seligman, one of the founders of positive psychology, proposed the well-known PERMA model of well-being. This model includes five core elements: Positive Emotion (P), Engagement (E), Relationships (R), Meaning (M), and Accomplishment (A). Seligman argued that these five elements together constitute human well-being, and each element is measurable and cultivable <sup>[5]</sup>.

In the PERMA model, positive emotion refers to the pleasant, satisfied, and happy emotional experiences that individuals have in life. Engagement refers to the state in which individuals are fully focused and immersed in an activity. Relationships refer to the positive interactions and close connections between individuals and others. Meaning refers to the valuable, purposeful goals and missions that individuals pursue in life. Accomplishment refers to the achievements and progress that individuals make in life.

In terms of well-being measurement, scholars have developed various scales. For example, Diener et al. developed the Satisfaction with Life Scale, which is widely used to measure individual life satisfaction <sup>[6]</sup>. Butler and Kern developed a well-being scale based on the PERMA model, which has been widely applied and validated among university students; this scale has also been widely used in China <sup>[7]</sup>.

### **2.2. Research on the well-being of Chinese university students**

As an important social group, the well-being level of university students has always attracted the attention of the academic community. For example, Ren and Zhao conducted a survey of 652 university students in Xi'an and found that the overall well-being level of university students is relatively high, but some students still have lower well-being levels <sup>[8]</sup>. Lin et al. conducted a survey of 751 university students in Fujian Province and found that the overall well-being of university students is good <sup>[9]</sup>.

At the same time, more scholars have begun to pay attention to the well-being of EMUS in China. For example, Hou et al. conducted a survey of 2780 EMUS and Han ethnicity university students (HEUS) in 10

universities in Nei Monggol <sup>[10]</sup>. The study found that there were no significant differences in PWB and overall well-being between Mongolian students and HEUS in Nei Monggol, but there were significant differences in SWB, with HEUS scoring higher than Mongolian students. Yin and Yu surveyed the well-being and influencing factors of 240 EMUS and HEUS in two typical universities in Yunnan Province <sup>[1]</sup>. The results showed that the well-being of HEUS was significantly higher than that of EMUS, and there were no significant differences in well-being among EMUS with different genders, grades, and ethnicities.

In summary, positive psychology provides a new perspective and methodological basis for well-being research. Chinese scholars have conducted extensive research on the well-being of university students and achieved rich research results. However, there is a relative lack of research on EMUS based on positive psychology theory, and there is a lack of systematic theoretical frameworks and sufficient empirical support. Therefore, this study utilized Seligman's PERMA model to explore the current status of well-being among EMUS in Yunnan.

### **3. Research methodology**

#### **3.1. Research population**

The research population for this study consists of all current university students at Yunnan Technology and Business University (YTBU) in China. The university currently has 25,607 registered students, of whom 7,796 are EMUS, accounting for approximately 30% of the total student population. These EMUS come from various ethnic groups within Yunnan Province.

#### **3.2. Research instruments**

Two research instruments were used in this study: a Demographic Information Questionnaire (DIQ) and a University Student Well-being Questionnaire (USWQ).

The DIQ was designed to collect basic personal information from participants, including gender, ethnicity, grade, and educational level. The USWQ was developed based on the well-being scale by Butler and Kern, which is grounded in the PERMA model <sup>[7]</sup>. It comprises six dimensions: positive emotion, engagement, relationships, meaning, achievement, and overall well-being, with a total of 16 items. The questionnaire uses an 11-point Likert scale, where 0 represents "not at all" and 10 represents "completely." The overall Cronbach's alpha coefficient for the USWQ was 0.967, the overall validity analysis was significant at less than 0.05, and the KMO test statistic was 0.971, indicating that the questionnaire possesses acceptable reliability and validity.

#### **3.3. Data collection and analysis**

In this study, the questionnaires were distributed to university students at YTBU via the Questionnaire Star APP. A total of 1,352 valid questionnaires were collected, with EMUS accounting for 31.29% (N=423) and HEUS accounting for 68.71% (N=929).

The data analysis for this study utilized SPSS 26.0 software. The data collected through the questionnaires were primarily analyzed using descriptive statistics, independent samples *t*-tests, and one-way ANOVA.

### **4. Data analysis results**

#### **4.1. DIQ data analysis results**

Analysis of the 1,352 valid questionnaires revealed that EMUS accounted for 31.29% (N=423), while HEUS



accounted for 68.71% (N=929). Among the EMUS sample, the gender distribution was as follows: 220 males (52.01%) and 203 females (47.99%). The grade distribution was as follows: 196 freshmen (46.34%), 82 sophomores (19.39%), 112 juniors (26.48%), and 33 seniors (7.8%). The distribution of educational levels was as follows: 46 students (10.87%) were in the Associate Degree program (ADP); 312 students (73.76%) were in the Bachelor's Degree program (BDP); and 65 students (15.37%) were in the Associate-to-Bachelor's Degree program (ABDP).

## 4.2. USWQ data analysis results

### 4.2.1. Overall well-being of emus

The survey of the overall well-being of EMUS revealed that the majority of respondents' well-being scores were concentrated between 5 and 10. The most common score was 8, with 97 respondents (22.93%) selecting this option. This was followed by scores of 10, 5, and 7, with 88 (20.8%), 67 (15.84%), and 65 (15.37%) respondents selecting these options, respectively. Relatively fewer respondents chose lower scores, such as 0 and 1, with only 2 (0.47%) and 3 (0.71%) respondents selecting these options, respectively. These results indicate that the majority of respondents rated their overall well-being highly, although some respondents felt less happy.

Additionally, to further analyze the central tendency and dispersion of the data, the mean and standard deviation were calculated. The mean was approximately 8.442, and the standard deviation was 2.046, also indicating that respondents generally rated their well-being highly.

To better understand the distribution of overall well-being among EMUS across various demographic variables, this study constructed **Table 1**. As shown in **Table 1**, female students generally reported lower overall well-being compared to their male counterparts. Among EMUS, those in the ABDP exhibited relatively higher overall well-being, while those in the BDP reported relatively lower well-being. Additionally, EMUS in their sophomore year had relatively lower overall well-being, whereas those in their junior year reported higher levels of well-being.

**Table 1.** Mean of overall well-being among EMUS across demographic variables

Demographic variable	Category	N	Mean	SD
Gender	Male	220	8.527	2.015
	Female	203	8.350	2.080
Educational level	ADP	46	8.500	2.147
	BDP	312	8.410	1.961
	ABDP	65	8.554	2.378
Grade	Freshman	196	8.505	1.975
	Sophomore	82	8.037	2.180
	Junior	112	8.589	2.108
	Senior	33	8.576	1.855

### 4.2.2. Differences in well-being dimensions and overall well-being between EMUS and HEUS

Independent samples *t*-tests were conducted to compare the well-being dimensions and overall well-being scores between EMUS and HEUS. The results, as shown in **Table 2**, indicated that there were no significant differences between EMUS and HEUS in the dimensions of meaning, achievement, engagement, and positive emotion ( $P>0.05$ ). However, significant differences were observed in the dimensions of relationships and overall well-being ( $P<0.05$ ), with EMUS scoring significantly higher than HEUS in these dimensions.

**Table 2.** *t*-test analysis results of well-being dimensions and overall well-being between EMUS and HEUS

Dimension	Ethnicity	N	Mean	SD	<i>t</i>	<i>P</i>	Cohen's <i>d</i>
Meaning	HEUS	929	23.04	6.04	-1.901	0.058	0.111
	EMUS	423	23.71	5.96			
Achievement	HEUS	929	23.41	5.84	-1.433	0.152	0.084
	EMUS	423	23.90	5.66			
Engagement	HEUS	929	24.05	5.44	-0.858	0.391	0.050
	EMUS	423	24.32	5.28			
Positive Emotion	HEUS	929	23.87	5.92	-1.846	0.065	0.108
	EMUS	423	24.50	5.66			
Relationships	HEUS	929	23.80	5.65	-2.240	0.025*	0.131
	EMUS	423	24.53	5.44			
Overall Well-being	HEUS	929	8.13	2.15	-2.517	0.012*	0.148
	EMUS	423	8.44	2.05			

Note: \* $P < 0.05$ ; \*\* $P < 0.01$

#### 4.2.3. Gender differences in well-being dimensions and overall well-being among EMUS

Independent samples *t*-tests were also conducted to examine gender differences in well-being dimensions and overall well-being among EMUS. The results, as shown in **Table 3**, revealed that there were no significant differences in the dimensions of positive emotion, relationships, meaning, and overall well-being between male and female EMUS ( $P > 0.05$ ). However, significant differences were found in the dimensions of engagement and achievement ( $P < 0.05$ ), with male students scoring significantly higher than female students in these dimensions.

**Table 3.** *t*-test analysis results of well-being dimensions and overall well-being among EMUS by gender

Dimension	Gender	N	Mean	SD	<i>t</i>	<i>P</i>	Cohen's <i>d</i>
Meaning	Male	220	24.19	5.94	1.726	0.085	0.168
	Female	203	23.19	5.95			
Achievement	Male	220	24.66	5.39	2.919	0.004**	0.284
	Female	203	23.07	5.85			
Engagement	Male	220	25.03	5.21	2.895	0.004**	0.282
	Female	203	23.56	5.26			
Positive Emotion	Male	220	24.92	5.62	1.579	0.115	0.154
	Female	203	24.05	5.69			
Relationships	Male	220	24.66	5.60	0.508	0.612	0.049
	Female	203	24.39	5.29			
Overall well-being	Male	220	8.53	2.01	0.891	0.373	0.087
	Female	203	8.35	2.08			

Note: \* $P < 0.05$ ; \*\* $P < 0.01$