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Contents

Original Articles

Cultural Comparison between China and Mongolia under the Global Development Initiative

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Abstract: China and Mongolia, with rich historical ties, share three main cultural dimensions: nomadic, agricultural, and trade cultures. Nomadic culture in Mongolia, rooted in the plateau, reflects resilience shaped by harsh environments and close ties to animal husbandry. China's agricultural culture, stemming from river basins, shapes a delicate and introverted character with intensive production methods. The coexistence of nomadic and agricultural cultures fosters communication through exchange and conflict, contributing to human civilization. This rich cultural backdrop adds historical depth to the intricate and complex interactions between China and Mongolia.

Keywords: Nomadic Culture; Agricultural Culture; Cultural Exchange and Conflict; Cultural Comparison; Cultural Inclusivity

1. Introduction

The "Global Development Initiative," rooted in China's unique path, introduces fresh perspectives to the global knowledge system, offering "Chinese thinking" and "Chinese wisdom." This initiative holds great relevance for cultural development between Mongolia and China, given their historical ties and aligned development goals. China's initiatives like the "Belt and Road" provide a practical platform for a shared human destiny and civilizational exchange. [1] Sino-Mongolian relations lay a strategic foundation for comprehensive cultural exchange. Both nations' nomadic and agrarian cultures address global challenges, drawing from ancient wisdom. Amid unprecedented global transformations, the collaboration on initiatives like "Belt and Road" fosters mutual development, addressing contemporary questions. Mongolia and China, through joint initiatives, contribute to a brighter future for human society, navigating the complexities of our times.

2. Similarities and Differences in the Development of Nomadic and Agricultural Civilizations

2.1 Similarities in the Understanding of Seasons

Nomadic and agricultural cultures share similarities in their understanding of seasons, particularly emphasizing the significance of spring. In China, there is an ancient saying, "A year's plan starts with spring," highlighting the importance of spring for both agricultural and nomadic societies. For agricultural civilizations, spring is the busiest season, focusing on activities like spring planting, summer sowing, autumn harvest, and winter storage. This period is crucial for the growth of crops, as agricultural communities work diligently to prepare for a bountiful harvest. Similarly, for nomadic cultures, spring holds profound meaning as it is the season when cattle and sheep reproduce. Despite the grasslands not reaching optimal quality and the animals being relatively lean, nomadic people consume stored winter meat during spring, prioritizing water retention and typically consuming dairy products and cured meat in the summer. In the autumn, agricultural civilizations celebrate the harvest season, gathering abundant grains for the winter. Nomadic cultures, on the other hand, focus on fattening their livestock in preparation for winter meat storage. These similarities reflect the sensitivity and adaptability of both cultures to natural cycles to meet the needs of their respective ways of life.

2.2 Cultural Differences

Nomadic and agricultural cultures, exemplified by Mongolia and Han Chinese, differ in geography, history, and culture. Mongolia's nomadic culture, rooted in the Xingu period, spans 2200 years, focusing on grassland tribes' dynamics. In contrast, Han Chinese agricultural heritage, originating 3400 years ago, has evolved through the Yin and Shang periods. Totems reveal distinctions: Chinese symbols like the dragon signify power, while Mongolian totems, including the grey wolf, reflect ecological respect. Production methods diverge, with Mongolians practicing nomadic herding, relying on water and grass, while Chinese agriculture employs various farming techniques. Literary

differences showcase Confucian classics in Chinese culture and heroic Mongolian epics. Attire and diet vary, with Mongolians prioritizing practicality in loose robes and a diet of noodles, meat, and dairy, while the Chinese emphasize culinary form using chopsticks.

2.3 Differences in Thinking Habits

Due to China's geographically enclosed mainland environment, Chinese thinking tends to be locally oriented, adept at summarizing the experiences of predecessors, and often draws inspiration from history. This inward-focused thinking contributes to a Chinese character inclined towards stability and tranquillity, with a limited curiosity for novel concepts and a lack of interest in the unknown. In contrast, Mongolians, situated on the Mongolian Plateau and influenced by nomadic warrior culture, lean towards conquering and embracing more adventurous endeavours. Chinese tend to contemplate issues on a higher level, emphasizing abstract thinking and profound reflections across various aspects of life. Conversely, Mongolians prioritize logical and rational thinking, exploring the material world to uncover the root causes of problems.

2.4 Economic System Differences

China's traditional economy is marked by a natural, self-sufficient economic system that nurtures a population characterized by docility. This agricultural politeness fosters an emphasis on ethical values, a pursuit of harmony and stability, and a commitment to the principles of "harmony is precious, patience is noble." The Chinese, influenced by their historical agricultural practices, tend to prioritize a conservative approach, and have a limited curiosity towards new and unknown phenomena. In stark contrast, Mongolian nomadic culture's politeness, originating from the vast landscapes of the Mongolian Plateau, imparts a robust spirit of struggle and a heightened legal consciousness. Mongolians advocate principles such as independence, freedom, and equality. Their focus leans more towards practicality, starting with a deep exploration of the material world, and they exhibit a strong sense of utilitarianism. This divergence in cultural values shapes the mindset of the Mongolian people, encouraging a more adventurous and exploratory approach to life compared to the Chinese emphasis on stability and tradition.

2.5 Cultural Concept Differences

Mongolian thinking places a greater emphasis on rationality, stressing fundamental changes through logical thinking. They prioritize material life, actively explore and experience the outside world. Conversely, Chinese people tend to be less open and adventurous. In Mongolian nomadic culture, there's a greater emphasis on reshaping the world to fit human needs, focusing on practical material life.

2.6 Educational and Cultural Differences

Chinese education, deeply influenced by feudal Confucian culture, places a high value on learning primarily for obtaining diplomas, with strict adherence to rules, an emphasis on rote memorization, and a rigid academic atmosphere. In contrast, Mongolian education diverges from this approach, placing a greater emphasis on individual abilities and requiring fewer diploma-centric prerequisites. Mongolians foster an environment that encourages innovation and critical thinking, prioritizing practical skills over mere theoretical knowledge. Additionally, they promote the expression of opinions and actively encourage students to learn foreign languages, fostering a more interactive and engaging educational experience. This cultural distinction reflects a broader perspective on education, with Mongolian practices emphasizing adaptability and a holistic approach to skill development.

2.7 Differences in Traditional Attire and Cuisine:

Traditional Mongolian robes, known for their width and versatility, serve as excellent attire for year-round outdoor activities. These robes also double as ideal blankets, providing comfort during outdoor sleep. The expansive design of the robes reflects the nomadic lifestyle of the Mongolian people, allowing for ease of movement and adaptability to varying weather conditions. When it comes to traditional Mongolian cuisine, the emphasis is on simplicity and practicality. Noodles, meat, dairy, and tea are staple components, reflecting the nomadic herding culture. The practical nature of Mongolian food aligns with the demands of their lifestyle, where nomads need nourishing and ener-

gy-rich meals to sustain their active and challenging way of life. In contrast, Chinese dietary practices place a significant emphasis on formality. The Chinese culture values the presentation and symbolism of food, with specific etiquettes governing meals. The emphasis on formality in Chinese dining reflects the cultural significance attached to meals and the importance of social harmony.

3. Mutual Fusion and Inevitability of Agricultural and Nomadic Civilizations

In resource-rich and accessible environments, civilizations emerge and endure. Agricultural cultures, characterized by peace and independence, thrive on self-sufficiency. The close bond between farmers and their fields reflects a pursuit of "expanding time rather than space." Nomadic civilizations inject new energy, leading to historical conflicts and exchanges. Agricultural civilizations absorb new traits from nomadic cultures, either adapting peacefully or engaging in war to restore balance. Historical interactions with ethnic minorities shape the interdependence between agricultural and nomadic civilizations. Kublai Khan's military power subdued the Song Dynasty, deepening cultural divides. Today, reflecting on the love and hatred between nomadic and agricultural civilizations, we recognize the importance of nomadic culture in the global village. The "Global Development Initiative," rooted in China's experience, enriches global knowledge and fosters cultural exchange with Mongolia. Initiatives like the "Belt and Road" and global development serve as the basis for Sino-Mongolian relations, laying the groundwork for extensive and deeper development. Post-pandemic, cultural exchange will deepen, contributing to a shared future and collective development.

4. Conclusion

The "Global Development Initiative," rooted in China's experiences, reshapes the global landscape in knowledge, relationships, and systems. It offers the world the "Chinese approach" and "Chinese wisdom," creating broad prospects for cultural development between Mongolia and China. Post-pandemic, cultural exchange will deepen, driven by a shared historical foundation. China's initiatives, including the "Belt and Road," global development, and global security, form the basis for a shared future and enhanced Sino-Mongolian relations. Both countries contribute strategic approaches to global challenges, drawing from nomadic and agrarian cultures. China and Mongolia, nourished by ancient wisdom, provide international public goods, embodying shared human values. In the context of complex human relationships, environmental dynamics, and geopolitical shifts, emerging nations rise swiftly, technological revolutions intensify, and global governance faces mismatches. Through initiatives like the "Belt and Road," China and Mongolia collaboratively contribute to a brighter future for humanity.

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Research Status and Frontier Analysis in the Reconstruction of Belief Space in Confucian Gardens

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Abstract: The aim of this study is to visually illustrate the current state of research on reconstructing belief space in Confucian Gardens and analyze the key areas for future investigation. The knowledge graph, which consists of 591 academic papers on the belief space of Confucian Gardens published on Web of Science from database inception until August 2023, has been analyzed using Cite-Space software. After conducting a thorough analysis of co-citation, co-occurrence, clustering, timeline, and burst maps, the identification of three promising avenues for future research has been achieved successfully. We anticipate that advanced research in the coming years will concentrate on three areas: "reconstructing urban belief space, enhancing spatial experiences, and exploring embodied cognition".

Keywords: Confucian Gardens; Overseas China Garden; Belief Space; Reconstruction; Cultural Geography

1. Introduction

In the context of globalization and urbanization, it is apparent that traditional gardens representing various nationalities actively contribute to reconstructing belief spaces in multicultural cities, thereby exemplifying a manifestation of modernity (Bruce 2016). Researchers in cultural geography, landscape planning, and sociology have made advancements in elucidating this phenomenon from their respective perspectives. However, there is limited research on the involvement of Confucian Gardens' belief space in contributing to the reconstruction of multicultural cities.

The belief space explored in this paper encompasses a wide range of spiritual environments, including religious and non-religious spaces (Hollway, 2011), such as churches, mosques, Buddhist temples, Taoist temples, and Confucian gardens established by immigrants in multicultural cities worldwide. Their experiences and strategies in reconstructing belief systems and ethnic communities can also provide valuable insights for the reconstruction of modern Confucian Gardens abroad.

Currently, a precise definition for Confucian Gardens in China remains elusive, and the concept of the Confucian Temple courtyard closely aligned with it has not yet developed into a distinct category within Chinese classical Gardens. On the contrary, the Confucian Temple courtyard is classified as a non-classical garden type known as the Temple of Altar due to its neatly arranged cypress forest that creates a solemn ambiance (Zhou, 2008).

Referring to the definition of "church garden" provided by Polish scholars Mitkowska (1998), this paper defines a Confucian Garden as a landscaped space enclosed by walls or plants, typically constructed within Chinese communities. In addition to incorporating elements from Chinese traditional Gardens, the Confucian Garden also includes symbolic landscape elements associated with Confucian belief.

2. Sources of data and research methodologies

The data in this paper were obtained from the core literature within the Web of Science (WOS) database. The search subject terms used were TS= (Confucian Garden OR overseas Chinese garden OR sacred space OR cultural geography) AND TS= (reconstruction). A total of 856 articles were retrieved as of August 14, 2023. After excluding conference papers, book reviews, and editorial materials, a final selection of 591 articles was included following thorough data verification.

The visualization software Cite-Space was used to analyze the existing literature data and create a visual knowledge map in the field of belief space reconstruction in Confucian Gardens until August 2023. Simultaneously, by combining literary interpretation, this paper anticipates future research trends.

3. Findings and analysis

3.1 Analysis of the number of published documents

From 2007 to 2016, an average of 25.6 papers were published annually. In more recent years (2017-2022), there has been a significant increase with an average of 49 articles published per year.

The scholarly contributions to these 591 publications involved authors from a total of 73 countries, with Chinese scholars accounting for approximately 5.41% of the total. The earliest literature examines how the Chinese-styled Tiger Balm Gardens contribute to Singapore's public space reconstruction (Huang, 2007).

3.2 Analysis of highly cited literature

Table 1 Top 6 highly cited literature in WOS database. (co-citations ≥30)

Year	Author	Title	Frequency
2008	Luz	The politics of sacred places: Palestinian identity, collective memory, and resistance in the Hassan Bek Mosque conflict.	31
2009	Maddrell	A place for grief and belief: the witness cairn, isle of Whithorn, Galloway, Scotland.	70
2009	Cheong	The internet highway and religious communities: mapping and contesting spaces in religion-online.	35
2010	Wilford	Sacred archipelagos: geographies of secularization.	71
2011	Banning	So fair a house：Göbekli Tepe and the identification of temples in the Pre-pottery neolithic of the near east.	68
2011	Banks	Eco-cultural niches of the Badegoulian: unraveling links between cultural adaptation and ecology during the last glacial maximum in France.	50

The highly cited literature data in the WOS database are summarized in Table 1 by publication year, covering disciplines such as sociology, cultural geography, and anthropology. Luz (2008) pioneered the study of the crisis faced by minority ethnic religious buildings during urban renewal processes. Subsequently, scholars such as Maddrell (2009) and Wilford (2010) have used "secular geography" to explain reconstructing architectural belief spaces in countries like Scotland, the United States and Australasia. At the same time, Cheong (2009) proposed that Geographic Information System and the Internet can enhance emotional transmission of ethnic community experiences. Furthermore, Banning (2011) and Bank (2011) separately examined the ritual sites in ancient settlements in Turkey and France, expanding both the temporal and geographical dimensions covered by this study.

After analyzing Table 1, we have identified two key aspects characterizing research on belief Gardens reconstruction: a concentration of highly cited literature before 2011 and a shift in research focus since 2009 from conflicts in urban public spaces to multi-ethnic integration and the promotion of harmonious coexistence.

3.3 Analysis of the Co-occurrence Map for Keywords

Using Cite-Space software, we generated a visually representative co-occurrence map that illustrates the keywords associated with this study (Figure 1). This visualization consists of 465 interconnected keyword nodes connected by 648 lines. The keywords "sacred space, religion, and politics" in the upper left corner of the map have limited relevance to this study; Instead, the remaining less prominent keywords reveal three promising avenues that can provide substantial guidance for future research.

The first avenue concentrates on urban spatial issues encompassing "geography-city-places". The second avenue investigates landscape diversity through "history-landscapes-diversity". The third avenue delves into subjective embodied cognition, such as "perceptions-pilgrimage-management".

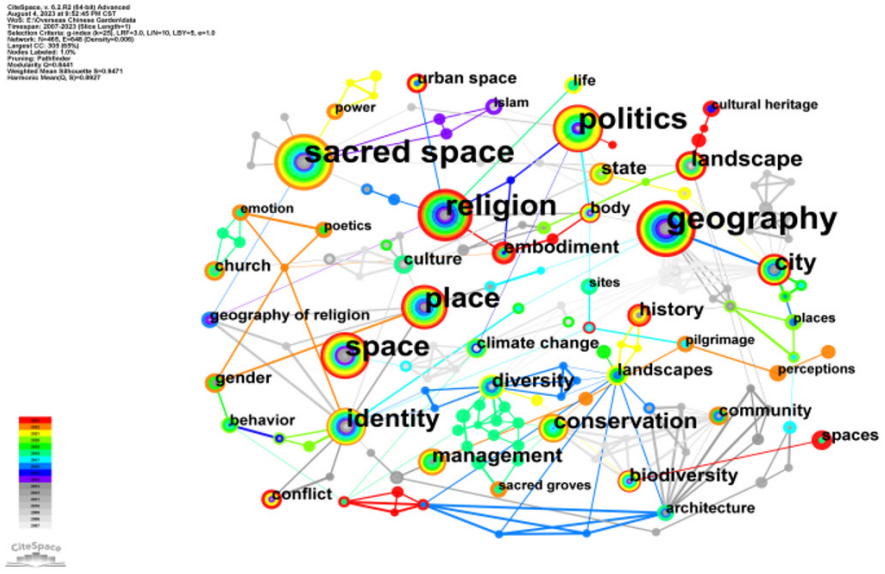

Figure 1 Co-occurrence map

3.4 Analysis of the Keyword timeline Map and its evolution

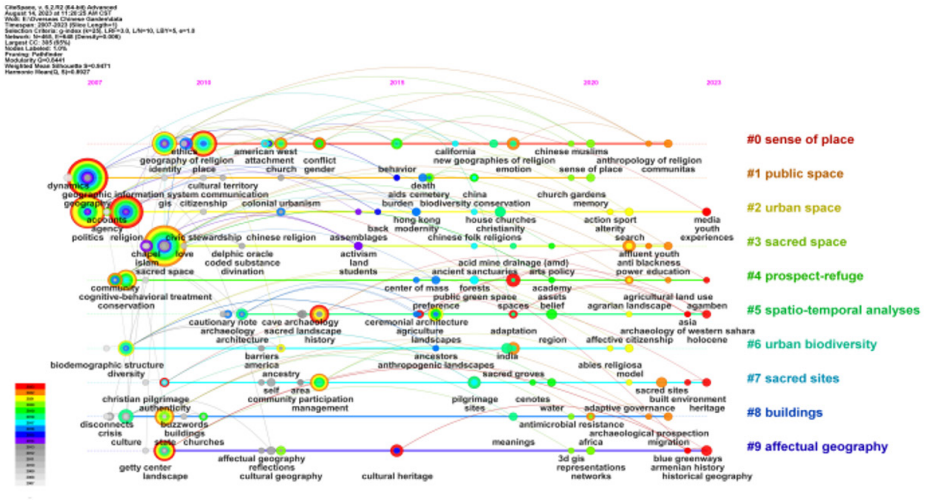

Figure 2 The timeline map and evolution analysis of keywords

In the intensive phase (2007-2011), high-frequency keywords focused on “sacred space, geography, politics, and place” in the keyword timeline map (Figure 2), indicating a shift towards secular narrative in geography. During the transitional period (2012-2016), scholars tended to conduct more practical research that benefits society with core keywords such as “sacred landscape, communication participation, ceremonial architecture, and cultural heritage”. The stable phase (2017 to present) emphasized investigating the interaction between garden spaces and individuals’ embodied cognition with core keywords including “public green space, emotion, pilgrimage, and sacred sites”.

3.5 Analysis of the Keyword Cluster Map

The LLR algorithm was used to cluster keywords using Cite-Space software, and the resulting clusters were displayed in the upper-left corner of Figure 3. Among them, modules with a Q value above 0.3 and an average contour S value exceeding 0.7 demonstrate that these ten representative clusters meet the data requirements. The integration of these clustering results generated Table 2, summarizing three research emphases: reconstruction of architectural belief space, urban belief space, and urban-rural belief space.

The first research emphasis focuses on reconstructing the sense of place in ceremonial architecture from an architectural and religious

sociological perspective (Maddrell, 2009; Della, 2018; Poon, 2010).

In the second research emphasis, clusters 1 and 2 focus on reconstructing belief spaces in multicultural urban renewal through integrating urban planning, landscape architecture design (Qian and Kong, 2018; Murat, 2016). Clusters 3 and 4 excel in historical investigations of architectural remnants and exploring spiritual meanings within ancient settllments (Morehart, 2010; Banning, 2011).

In the third research emphasis, clusters 5 and 7 utilize spatial remote sensing technology and Eco-cultural niche models for spatio-temporal analysis, providing valuable references for establishing Confucian ancient pilgrimage sites (Monteleone, 2021; Banks, 2011). Conversely, clusters 6 and 9 focus on promoting harmony between humans and nature by approaching urban green space systems from the perspectives of biodiversity and affectual geography (Jaganmohan, 2018; Hayden, 2010).

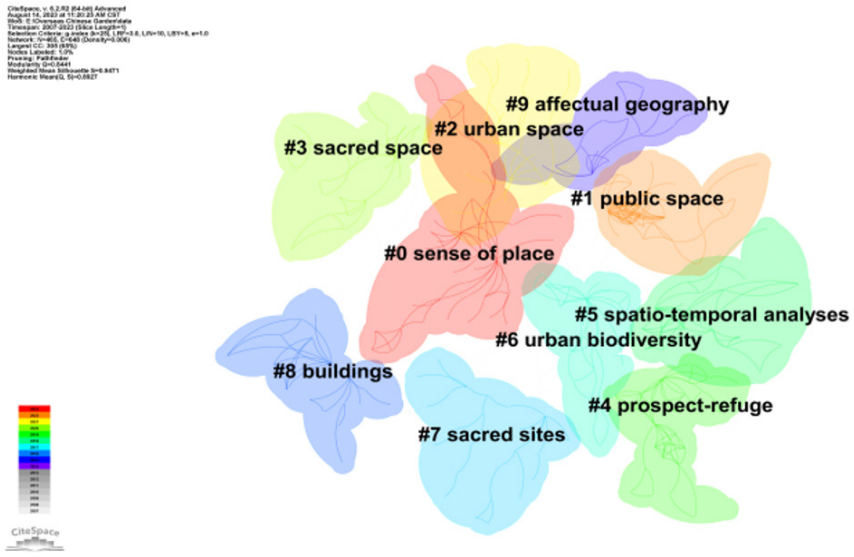

Figure 3 The keyword cluster map

Table 2 Analysis of the keyword cluster map

Cluster ID	Label	Size	Research emphasis
#0	sense of place	42	reconstruction of architectural belief space
#8	buildings	19	
#1	public space	30	reconstruction of urban belief space
#2	urban space	30	
#3	sacred space	28	
#4	prospect-refuge	27	
#5	spatio-temporal analyses	26	reconstruction of urban-rural belief space
#7	sacred sites	25	
#6	urban biodiversity	25	
#9	affectual geography	17	

3.6 Frontier analysis in the reconstruction of belief space in Confucian Gardens

The “Burstness” feature in Cites-Space was utilized to identify the emerging data of all keywords in the literature, and these findings are depicted in Figure 4.

During the initial and medium period (2007-2016), “knowledge, geography of religion, and space” emerged as burstness keywords, reflecting cultural geographers’ focus on explaining the reconstruction of urban belief spaces in multicultural cities. Since 2017, keywords like “state” and “politics” have gained prominence, reflecting a growing interest in addressing coexistence and competition among ethnic communities in multicultural cities.

The keywords “perception” and “embodiment” exhibit the highest level of emergence in 2022, followed by “residents, tourism, and sacred sites”, all relevant to faith-based tourism behaviour.

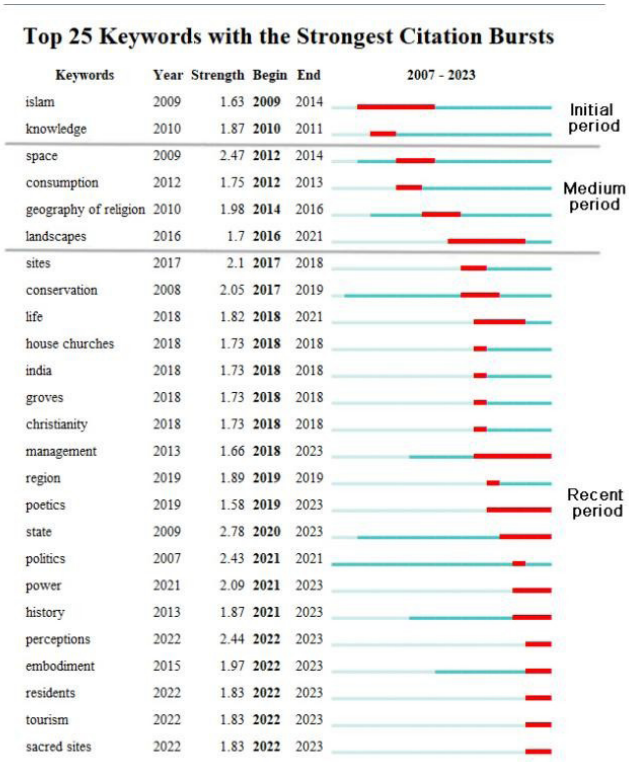

Figure 4 Keywords Burst Map

4. Conclusion

The aforementioned analysis suggests that recent cutting-edge research on garden belief space has primarily focused on "reconstructing urban belief space, enhancing spatial experiences, and exploring embodied cognition". Consequently, the reconstruction of belief space in Confucian Gardens is likely to emerge as a prominent research topic. When Confucian Gardens participate in the urban space renewal of multicultural cities overseas, their planning, construction, and management should draw upon these frontier research findings. Future modern Confucian Gardens can transmit elegant spatial experiences and embodied cognition to showcase the contemporary value and universal significance of Chinese traditional garden culture.

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Analysis of the Reform Plan for the Course Evaluation System of Automotive Testing and Maintenance Technology in Vocational Colleges

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Abstract: Vocational education is undergoing a period of transformation and development in sync with the economy and society. The evaluation content of automotive inspection and maintenance majors in vocational colleges has also changed rapidly with the development of various education systems. This article analyzes the shortcomings of the evaluation courses of these majors and identifies a series of specific improvement issues. It also proposes countermeasures and suggestions to address the limitations of this profession from the perspectives of evaluation methods, objectives, and staff. By laying a solid foundation for students' future growth, this article aims to promote the continuous improvement of their comprehensive qualities and foster good study habits.

Keywords: Vocational Colleges; Automotive Inspection and Maintenance; Evaluation System; Suggestions for Countermeasures

Continuously transforming and developing evaluation thinking in the current education process of vocational colleges, broadening teachers' evaluation thinking, can not only help students cultivate good professional skills, but also achieve student transformation and development, promoting the comprehensive promotion of the current evaluation process. The development of modern education provides students with greater space for independent exploration and development, and can also promote the improvement and enhancement of the current evaluation system, laying the foundation for their development and achieving the updating and improvement of the professional system of automotive inspection and maintenance. This article analyzes the shortcomings of the evaluation system for automotive inspection and maintenance in modern education, as well as suggestions for improvement.

1. The shortcomings of the evaluation system for automotive inspection and maintenance in vocational colleges

1.1 The evaluation concept has not changed

In the current development of automotive inspection and maintenance majors in vocational colleges, there are still significant problems with the evaluation concepts of teachers. The evaluation approach of automotive inspection and maintenance majors in vocational colleges in our country is limited by traditional evaluation models, which only focus on a series of evaluation processes based on subject content and only focus on professional courses. However, under this type of evaluation approach, it is difficult to achieve subject centered expansion exercises, nor can it broaden students' thinking. Although various disciplines revolve around the center of automotive inspection, they have developed independently and cannot form a comprehensive and complete disciplinary system. Therefore, students are unable to further control the core competencies of their profession. With the booming development of the automotive industry in recent years, students should also have more detailed plans for their employment direction. On this basis, students should continuously transform their professional scientific knowledge into practical education under the guidance of teachers. These cannot be achieved solely through the efforts of students. Therefore, teachers should continuously adjust their evaluation models and combine scientific evaluation ideas to broaden the scope of student knowledge. This can also ensure that all types of professional knowledge can make certain efforts for the current automotive inspection profession and break through the limitations in the evaluation practice process.

1.2 The evaluation content has not been updated

The evaluation content of the automotive inspection and maintenance profession updates very slowly, which is contrary to the current booming economic development situation. Therefore, in this situation, there will be a significant gap between the curriculum and practice.

Students are unable to apply what they have learned in the process of production practice. Linking knowledge with real life. On the one hand, it will lead to students being unable to mobilize their enthusiasm for hands-on operations during the practical process. On the other hand, it can also lead to differential perceptions of students among enterprises, making it difficult to solve their employment problems. In the current evaluation process, the evaluation content indicators are extracted from textbooks. Although they have a certain degree of scientific practicality, some universities only choose universal textbooks on the market, which can lead to significant differences between the content indicators and practice. Automotive inspection and maintenance is a professional content with strong hands-on practice, so practice is also an important part of course learning. Students should continuously cultivate their hands-on practical ability and service industry, consciously exercise their operational ability in the evaluation process, combine scientific knowledge in textbooks with real life, and continuously enrich and develop the content.

1.3 The evaluation approach is relatively rigid

In the current evaluation process of automotive inspection and maintenance majors in vocational colleges, there is still a certain degree of rigidity in the evaluation thinking of teachers. Teachers use a pressure filled evaluation method to explain knowledge to students. Although this can help students understand their own shortcomings, it does not achieve certain practical abilities, thinking expansion, etc. Because of this, students may develop a certain resistance towards this major, which ultimately hinders the further advancement of evaluation work. Currently, many teachers in vocational colleges have not improved their knowledge level and practical ability to a certain extent. In the process of evaluation for many years, teachers have not developed or changed their own evaluation ideas. Instead, they rigidly follow the rigid evaluation content to evaluate students, without fully improving their practical ability. Students are also in a passive process when receiving guidance from teachers, As a result, it will be difficult to adapt to the working state in future practice.

2. Strategies and suggestions for improving the evaluation system of automotive inspection and maintenance courses in vocational colleges

2.1 Transforming traditional evaluation methods

In the process of evaluation, teachers should improve their own evaluation thinking, achieve the transformation and improvement of evaluation methods, absorb more advanced evaluation concepts and models, in order to achieve the vigorous development of subject evaluation. When continuously constructing the curriculum system, teachers should transform the traditional system construction centered on subject knowledge, cultivate students' hands-on operation ability more, and make vocational skills the focus of current education and training. At the same time, teachers also need to connect various evaluation contents to form a tightly integrated whole, achieving efficient evaluation process. This can not only promote the development of evaluation work, but also adapt to modern economic construction, provide students with more advanced insights, and achieve continuous improvement of vocational education level.

On the other hand, continuously transforming the evaluation mode can also promote the transformation of the current development process of teacher evaluation and improve the requirements of modern evaluation. Teachers need to fully learn scientific evaluation methods and use multimedia technology to achieve more advanced improvement in the evaluation process. The comprehensive development of modern evaluation not only provides students with greater practical space, but also promotes the improvement of the education system, giving greater inspiration to the current education model. Using multimedia to evaluate content can enable students to engage in the futureIn practice, higher levels of transformation can also be achieved. In the process of using multimedia for evaluation, teachers should also comprehensively develop content, work together with students to pay attention to their growth, lay a good foundation for them, and achieve comprehensive improvement in various types of educational work.

2.2 Reasonably setting talent training goals

Reasonably setting talent training objectives not only meets the requirements of current educational development, but also is a key focus of the evaluation system for automotive inspection and maintenance majors in vocational colleges. The goal of talent cultivation is

currently the focus of the evaluation process, but there are still some relatively slow updating contents. Teachers need to identify the basic content, combine it with modern development processes, and flexibly apply relevant knowledge in order to promote the comprehensive development of the evaluation system and achieve the improvement of students' modernization level. Throughout the evaluation process, teachers should flexibly apply various types of knowledge points in textbooks, continuously update and improve talent training goals, and promote the transformation of evaluation models. In addition, teachers also need to supplement extracurricular knowledge on the basis of in class knowledge, so that students can not only learn professional knowledge in class, but also understand other knowledge outside of class, giving students modern inspiration, and thus achieving the cultivation of excellent talents.

2.3 Improve the construction of the education team

The further construction and improvement of the teaching staff require schools to provide scientific training for teachers. Although current vocational college teachers in the field of automotive inspection and maintenance attach great importance to the construction of evaluation theories, they neglect the personalized training of students, making it difficult to achieve a comprehensive modern scientific system. This has led to certain shortcomings in the growth of students. Throughout the evaluation process, teachers need to connect with the development of students, integrate modern and scientific evaluation systems with their growth, and achieve more scientific educational methods. This not only achieves the comprehensive development of evaluation work, but also promotes the transformation and improvement of the scientific system. In the evaluation process, schools can also invite employees of various types from enterprises to communicate and exchange ideas with students. This not only helps students achieve more comprehensive development, but also brings more advanced evaluation requirements, adapts to the current work in society, and achieves the updating and improvement of modern evaluation.

2.4 Promote the integration of practice and theory

Continuously promoting the combination of theory and practice in evaluation is of utmost importance in the classroom evaluation system. Therefore, teachers should provide students with guiding inspiration and help them complete learning tasks. In daily work, teachers need to combine theory with practice and make certain updates and developments in their knowledge. In the process of evaluation, teachers also need to timely collect practical content that is more in line with modernization, supplement the classroom, and achieve certain inspiration and improvement for various types of evaluation work, thereby achieving the development of evaluation content. With the development of the automotive inspection and maintenance major in current vocational colleges, teachers should pay attention to the reform of the discipline, so that students can combine modern requirements for learning, thereby achieving the cultivation and improvement of personal qualities, and adapting to the current social needs for talent development.

3. Summary

The development of the vocational automotive inspection and maintenance profession requires teachers to pay attention to the content and structure of the evaluation system and provide meaningful guidance to students. This can promote the development and improvement of the current education evaluation system, as well as help students achieve continuous personal growth, learn scientific knowledge and practical skills related to automotive inspection and maintenance, and enhance their own abilities.

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On the Theoretical Attributes and Legal Regulations of the Measures of "Taking Personal Files into Account" in University Governance

——Management of Non-Motor Vehicles in Colleges and Universities-Including Personal Files-Qualitative and Regulation

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Abstract: Some colleges and universities in the management of campus non-motor vehicles in the process of the use of "personal files" a new means. In theory, such means should be characterized as administrative punishment, and its establishment and implementation should be subject to the legal regulation of the "Administrative Punishment Law".

Keywords: Accounting for Personal Files; Administrative Punishment; University Autonomy; Excessive Punishment

1. Introduction

In order to effectively solve the problem of non-motor vehicle management on campus, a number of universities across the country have issued a notice on promoting the management of non-motor vehicles on campus, the content of the notice shows a strong administrative color in the management means, "students who use non-motor vehicles on campus in violation of the school rules and discipline will be given a warning above punishment, included in the personal personnel file" this provision caused controversy. There is still a theoretical gap on whether universities have the right to take the administrative penalty measure of "including personal files" for self-governance. This paper attempts to cut into the disciplinary measure of "including personal files" by comparative analysis, determine the legality of the administrative penalty measure adopted by colleges and universities, and provide ideas for the innovation of administrative penalty forms.

2. Observation of the use of personal files

In the past year or two, many colleges and universities across the country have introduced measures to control campus non-motor vehicles, hoping to maintain campus order and safety.

"Notice of College of Chemistry and Chemical Engineering of Ocean University of China on the special management of non-motor vehicles" involved in the "violators will be included in the personal file" as a new face of university punishment should be included in the team of administrative punishment according to the purpose and nature of its punishment. However, is the punishment of "including personal files" implemented by colleges and universities an administrative punishment? If yes, does the university have the power of administrative punishment? If so, how should universities punish them? How to control the scale of punishment?

Unfortunately, there are no articles with direct answers to these questions, and there are only two articles with strong relevance and reference value. Therefore, it is a task to complete the research on the legality of the new administrative punishment means of "including personal files" in colleges and universities, and to explore whether colleges and universities have created new administrative punishment means in the practice of autonomy.

3. The attributes included in the personal file are clear

3.1 The legal attribute identification of the autonomy of administrative punishment means in universities

Administrative punishment refers to the administrative sanction given by the specific administrative subject to the administrative counterpart who violates the administrative order but does not constitute a crime. According to the relevant provisions of Article 28 of the Education Law, Article 20 and Article 22 of the Higher Education Law and Article 8 of the Regulations on Academic Degrees of the People's

Republic of China, it can be confirmed that universities are organizations explicitly authorized by the above-mentioned laws and regulations [1]. At the same time, the university undertakes the function of managing public affairs, which is in line with the provisions of Article 17 of the Administrative Punishment Law. Therefore, colleges and universities belong to social organizations authorized by law with administrative functions, and are legal administrative subjects to implement administrative penalties.

According to Article 8 of the Administrative Punishment Law, there are six types of administrative punishment: warning, notification and criticism; Fines, confiscation of illegal gains and confiscation of illegal property; Suspend the license certificate, order production and business suspension, order closure, restrict employment; Administrative detention; Other administrative penalties provided for by laws and administrative regulations, "included in personal files" are not included in the above six forms.

The information that is included in the personal file will follow the file holder for the rest of his life. It is the objective permanence of the file information that colleges and universities use to deter students. This is similar to ink punishment in Chinese legal history: it is done by affixing permanent negative labels to those who violate the management order in some concrete form. According to the purpose interpretation, combined with the definition of administrative punishment, the sanctions "included in personal files" of colleges and universities can be counted as administrative penalties.

The purpose of punishment is to reform offenders from the perspective of promoting the better development of the whole society. Therefore, in the context of recognizing the legitimacy of the right of colleges and universities to exercise administrative punishment, how to make colleges and universities legally and properly use administrative punishment is more critical.

4. Regulation scheme included in personal files

Relying on the "Administrative Penalty Law", from the two aspects of establishment and implementation, the "personal file" is regulated by law.

4.1 Strictly control procedures and eliminate blind spots in the rule of law

According to the judgment opinions of the courts in Ren Li v. Guangdong Provincial Department of Education (2017), Zheng Min v. Tongji University (2016) and Wu Jianzhang v. Beijing Film Academy (2018), it can be seen that the courts have strict requirements on the full performance of procedural justice by universities in judicial practice [2]. Colleges and universities should strictly follow the procedures stipulated by the school rules when making administrative penalties for students in personal files, and reduce the discretion space of the school for this measure. Before a student's violation is included in his/her personal file, he/she should be informed in advance, and at the same time explain to him/her the factual basis and reasons for taking the punishment method included in his/her personal file. Besides, he/she should also protect the student's statement and defense right and listen to the explanation and explanation of the student's violation. Finally, colleges and universities should provide channels for the student's right relief. For example, hearings were held on student representatives, administrative leaders and school leaders to ensure the protection of the legitimate rights and interests of students on campus.

4.2 The application of the principle of proportionality

Colleges and universities should pay special attention to the proportionality between means and ends when applying disciplinary measures. It can be seen from the above description: "Taking personal files into account" is a highly punitive administrative punishment method. Therefore, colleges and universities should follow the legal and reasonable boundaries when using this administrative punishment method, strictly control the scale, and prudently apply it to university governance, combining the reasons for students' violations, circumstances of violations, subjective faults, harm degree and correction. When there are multiple possibilities of interpretation of the school rules, and when various administrative penalties can be exercised for the violations, the punishment form that causes the least damage to students should be selected from the purpose of the school rules and the goal of campus management.

4.3 Appropriate decentralization of administrative penalty power

As the General Secretary stressed: all major reforms must be based on legal evidence. After all, university regulations can not play the

role of law, and the gap of legislation on the administrative punishment power of universities needs to be filled.

The decentralization of administrative penalty power to national colleges and universities needs to adhere to the principle of decentralization according to law, and the Administrative Penalty Law clearly stipulates that the decentralization subjects are only provinces, autonomous regions and municipalities directly under the central government, and the undertaking subjects are limited to township people's governments and street offices, obviously colleges and universities are not among the decentralization subjects stipulated by law. The National People's Congress and its standing committee can delegate the power of administrative punishment to the national colleges and universities according to the background of the current legal rule of university autonomy, and timely amendment of the law provides sufficient legal basis for the decentralization of administrative punishment power. For the specific matters of the decentralization of administrative penalty power, the leading group for the decentralization of administrative penalty power of The State Council can be formed to draft the Decision on Promoting the decentralization of Administrative Penalty power to colleges and universities, and make framework provisions on the decentralization of administrative penalty power to colleges and universities. Finally, with the help of the rapidly advancing record review system, the standing Committee of the local People's Congress will strengthen the legitimacy review of the decision to delegate the power of administrative punishment, and complete the closed-loop supervision of the decentralization of administrative punishment power [3].

5. Conclusion

In view of the extensive use of significant means of administrative punishment in colleges and universities, this paper holds that colleges and universities have the power of administrative punishment, and the disciplinary measure of "including personal files" formulated by them can be regarded as the creation of a new form of administrative punishment. On the premise of ensuring that colleges and universities can reasonably implement administrative punishment according to the legal framework and school rules and disciplines, filling the legislative gap of administrative punishment power decentralization can greatly promote the process of the rule of law of colleges and universities, and enrich the connotation of administrative punishment.

The purpose of this article is to accelerate the legalization of university autonomy in our country by including "personal file" into administrative punishment. In order to promote the process of legalization of university governance in a more comprehensive and accurate way, it is also necessary to scientifically evaluate the comprehensive impact of delegating the power of administrative punishment to universities, carry out more in-depth work around the framework sorted out in this paper, combined with the actual situation of universities and other aspects, and verify its feasibility by combining cases and implementing pilot projects.

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Based GeoGebra Software to Explore the Fixed Value Problem in Conic Curves

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Abstract: With the dynamic demonstration function of GeoGebra software, a class of fixed value problems in conic curves is dynamically explored, students are inspired to find out the nature of "unchanging" from "changing", and they are guided to observe, generalize,conjecture and prove the generalized mathematical conclusions, and analogies from parabola to ellipse and hyperbola.

Keywords: GeoGebra Software; Fixed Value Problems; Dynamic Exploration

Introduction

GeoGebra is a powerful dynamic demonstration software, precisely provides an ideal platform for students' inquiry activities, which helps students get rid of complicated arithmetic operations in order to save more time and energy for exploring and discovering mathematical laws.

1. Presentation of the topic

It is known that the parabola $C: y^2 = 2px\ (p > 0)$ has its focus at F and a line *l* through N (2,0) intersects C at two points A and B. When *l* perpendicular to the x-axis, the $|AB| = 4$.

(1) Find the equation of C.

(2) If there exists a point P on the x-axis,let the slope of the line PA and the line PB are k_{PA} and k_{PB} respectively, the $k_{PA} + k_{PB} = 0$ constantly, find the coordinates of point P.

The solution: (1) When *l* is perpendicular to the x-axis, we have from the question $|AB| = 4\sqrt{p}$ and thus $4\sqrt{p} = 4$ and solve for $p = 1$, so the equation of the parabola C is $y^2 = 2x$.

(2) From the question, it is clear that the slope of the *l* is not 0.Let the line $l: x = my + 2$,the $P(x_0, 0)$, $A(x_1, y_1)$, $B(x_2, y_2)$. The association of $\begin{cases} x = my + 2 \\ y^2 = 2x \end{cases}$ and elimination of x organizes to give $y^2 - 2my - 4 = 0$. We have that $\Delta = 4m^2 - 4 \times 1 \times (-4) = 4(m^2 + 4) > 0, y_1 + y_2 = 2m, y_1 \cdot y_2 = -4$, so

$$k_{PA} + k_{PB} = \frac{y_1}{x_1 - x_0} + \frac{y_2}{x_2 - x_0} = \frac{y_1}{my_1 + 2 - x_0} + \frac{y_2}{my_2 + 2 - x_0}$$

$$= \frac{2my_1y_2 + (2 - x_0)(y_1 + y_2)}{(my_1 + 2 - x_0)(my_2 + 2 - x_0)} = \frac{-4m - 2mx_0}{(my_1 + 2 - x_0)(my_2 + 2 - x_0)} = 0$$

i.e.$-4m - 2mx_0 = 0$ and thus solves for $x_0 = -2$.

In summary, when $k_{PA} + k_{PB} = 0$ constantly, the coordinates of point P are (-2,0).

Observing point P (-2,0) and point N (2,0), you can find that they are symmetric about the y-axis, which leads to the conjecture that if $k_{PA} + k_{PB} = 0$ constantly, then the transverse coordinates of point P and point N are opposite to each other. So with the help of GeoGebra software to carry out dynamic investigation, to verify the conjecture.

1.1 Dynamic investigation of parabolas

It is known that the parabola $C: y^2 = 2px\ (p > 0)$ and a line through the point $N(x_N, 0)\ (x_N > 0)$ intersects C at points A and B. There exists a point P on the x-axis, and the slopes of the line PA and the line PB are k_{PA}, k_{PB} respectively. If $k_{PA} + k_{PB} = 0$ constantly, ask: Are the coordinates of the point $P(-x_N, 0)$.

Dynamic Exploration of Results:

(1) As shown in Figure 1, under the condition of $k_{PA} + k_{PB} = 0$, change the *p* and the k_{PA}, the coordinates of point N(3,0) remain un-

changed, at this time the coordinates of point P is always (-3,0).

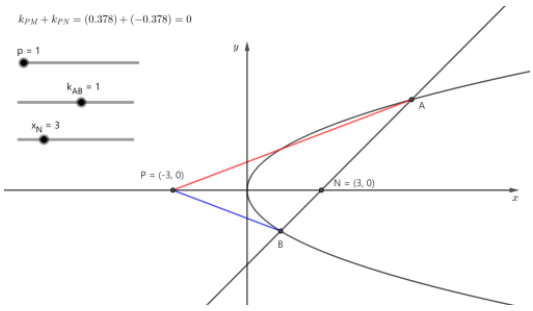

Figure 1

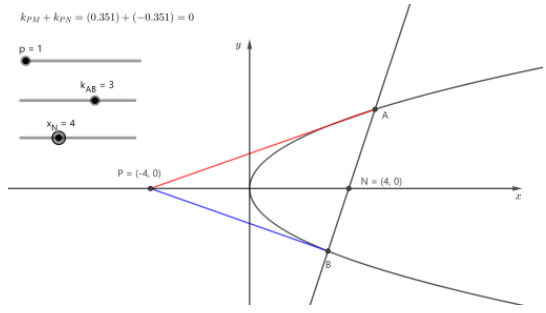

Figure 1

(2) As in Figure 2, under the condition of $k_{PA} + k_{PB} = 0$, take the $p = 1$, the $k_{AB} = 3$, change the x_N, at this time the coordinates of the point P are changed and always $(-x_N, 0)$.

1.2 Conclusion of the parabolic generalization

It is known that the parabola $C: y^2 = 2px\ (p > 0)$ and a line through the point $N(x_N, 0)\ (x_N > 0)$ intersects C at points A and B. There exists a point P on the x-axis, and the slopes of the line PA and the line PB are k_{PA}, k_{PB} respectively. If $k_{PA} + k_{PB} = 0$ constantly, then the coordinates of point P are $(-x_N, 0)$.

The proof: from the condition, the line *l* has a slope that is not 0. Let $l: x = my + x_N, P(x_P, 0)$, $A(x_1, y_1)$, $B(x_2, y_2)$. The association $\begin{cases} x = my + x_N \\ y^2 = 2px \end{cases}$ and elimination of x organizes to give $y^2 - 2pmy - 2px_N = 0$.We have that $\Delta = 4p^2m^2 - 4 \times 1 \times (-2px_N) = 4p(m^2 + 2x_N) > 0$, $y_1 + y_2 = 2pm$, $y_1 \cdot y_2 = -2px_N$, so

$$\begin{aligned} k_{PA} + k_{PB} &= \frac{y_1}{x_1 - x_P} + \frac{y_2}{x_2 - x_P} = \frac{y_1}{my_1 + x_N - x_P} + \frac{y_2}{my_2 + x_N - x_P} \\ &= \frac{2my_1y_2 + (x_N - x_P)(y_1 + y_2)}{(my_1 + x_N - x_P)(my_2 + x_N - x_P)} = \frac{-2pmx_N - 2pmx_P}{(my_1 + x_N - x_P)(my_2 + x_N - x_P)} \\ &= 0 \end{aligned}$$

i.e. $-2pmx_N - 2pmx_P = 0$ and thus solves for $x_P = -x_N$.

In summary, when $k_{PA} + k_{PB} = 0$ constantly, the coordinates of point P are $(-x_N, 0)$.

2. Variant Exploration

Are there similar properties in ellipses and hyperbolas? Use GeoGebra software to explore variations.

2.1 Dynamically Exploring Ellipses

It is known that the ellipse $C: \frac{x^2}{a^2} + \frac{y^2}{b^2} = 1\ (a > 0, b > 0)$ and the straight line *l* (slope not 0) through the point $N(x_N, 0)$ intersects C at points A and B. There exists a point P on the x-axis, and the slopes of the line PA and the line PB are k_{PA}, k_{PB} respectively. If $k_{PA} + k_{PB} = 0$ constantly, ask: How do the coordinates of point P change.

Dynamic Inquiry Results:

(1) As in Figure 3, if the $k_{PA} + k_{PB} = 0$, take $a = 4$ and the coordinates of the point N are (2,0), change the value of *b* and the slope of the line *l*, when the coordinates of point P are always (8,0).

(2) As in Figure 4, if $k_{PA} + k_{PB} = 0$, take $b = 5$, change the x_N and *a* values, the transverse coordinate of point P changes accordingly.

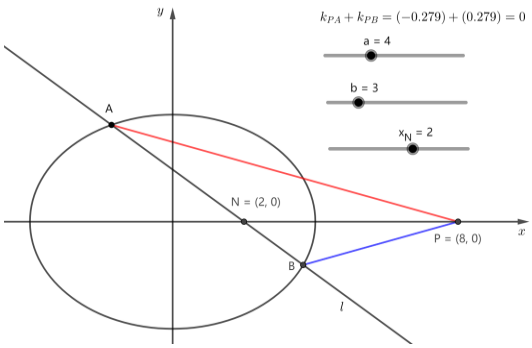

Figure 3

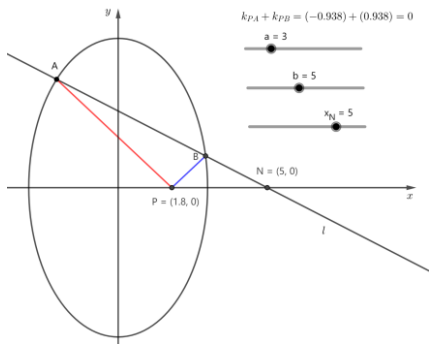

Figure 4

Let the horizontal coordinates of the point P be $\mathbf{x_P}$, use the controlled variable method to investigate the relationship between $\mathbf{x_N}$, a and $\mathbf{x_P}$.

Take $a = 5$, change $\mathbf{x_N}$ value while recording the $\mathbf{x_P}$ value to get Table 1. Take $\mathbf{x_N} = 3$, change the value of a and record the value of $\mathbf{x_P}$ to obtain Table 2. Observing Table 1 and Table 2, it is easy to find that $\mathbf{x_N}$,$\mathbf{x_P}$ and a are satisfied $\mathbf{x_N} \cdot \mathbf{x_P} = a^2$.

Table 1 Changing values

$\mathbf{x_N}$	$\mathbf{x_P}$	a	a^2
-10	-5/2	5	25
-8	-25/8	5	25
-6	-25/6	5	25
-4	-25/4	5	25
-2	-25/2	5	25
2	25/2	5	25
4	25/4	5	25
6	25/6	5	25
8	25/8	5	25
10	5/2	5	25

Table 2 Changing values

$\mathbf{x_N}$	$\mathbf{x_P}$	a	a^2
3	1/3	1	1
3	4/3	2	4
3	3	3	9
3	16/3	4	16
3	25/3	5	25
3	12	6	36
3	49/3	7	49
3	64/3	8	64
3	27	9	81
3	100/3	10	100

2.2 Conclusion of elliptic generalization

It is known that the ellipse $C: \frac{x^2}{a^2}+\frac{y^2}{b^2}=1\ (a>0, b>0)$ and the point $\mathbf{N}(\mathbf{x_N}, 0)$ on the x-axis, a line l (slope not 0) through point N intersects C at points A and B. On the x-axis there exist points $\mathrm{P}(\mathrm{x_P}, 0)$, the slopes of the line PA and the line PB are $\mathbf{k_{PA}}$, $\mathbf{k_{PB}}$ respectively. If $\mathbf{k_{PA}} + \mathbf{k_{PB}} = 0$ constantly, then $\mathbf{x_N}$, $\mathbf{x_P}$ and a are satisfied $\mathbf{x_N} \cdot \mathbf{x_P} = a^2$.

The proof: Let the line $l: x = my + x_N$, $A(x_1, y_1)$, $B(x_2, y_2)$.

The association $\begin{cases} x = my + x_N \\ \frac{x^2}{a^2}+\frac{y^2}{b^2}=1 \end{cases}$ and elimination of x organizes to give $(b^2m^2 + a^2)y^2 + 2mb^2x_Ny + b^2(x_N^2 - a^2) = 0$. We have that $\Delta = 4m^2b^4x_N^2 - 4b^2(b^2m^2 + a^2)(x_N^2 - a^2) > 0$, $y_1 + y_2 = -\frac{2mb^2x_N}{b^2m^2+a^2}$, $y_1 \cdot y_2 = \frac{b^2(x_N^2-a^2)}{b^2m^2+a^2}$, so

$$k_{PA} + k_{PB} = \frac{y_1}{x_1 - x_P} + \frac{y_2}{x_2 - x_P} = \frac{y_1}{my_1 + x_N - x_P} + \frac{y_2}{my_2 + x_N - x_P}$$

$$= \frac{2my_1y_2 + (x_N - x_P)(y_1 + y_2)}{(my_1 + x_N - x_P)(my_2 + x_N - x_P)} = 0$$

Namely $2my_1y_2 + (x_N - x_P)(y_1 + y_2) = \frac{2mb^2(x_N^2-a^2)}{b^2m^2+a^2} - \frac{(x_N-x_P)2mb^2x_N}{b^2m^2+a^2} = 0$,

i.e. $2mb^2(x_N^2 - a^2) = (x_N - x_P)2mb^2x_N$ and thus solves for $x_N \cdot x_P = a^2$.

Analogous to ellipses, does the conclusion still hold in hyperbolas? Verify the conjecture using GeoGebra software.

2.3 Dynamic exploration of hyperbola

A known hyperbola $C:\frac{x^2}{a^2}-\frac{y^2}{b^2}=1\ (a>0,b>0)$ and a line *l* (slope not 0) through the point $N(x_N,0)$ intersects C at points A and B. On the x-axis there exist points $P(x_P,0)$, the slopes of the line PA and the line PB are k_{PA}, k_{PB} respectively. If $k_{PA}+k_{PB}=0$ constantly, ask: $x_N\cdot x_P=a^2$ does it hold?

Dynamic exploration results: as shown in Figure 5, changing the x_N and *a* values while recording the x_P values, it is easy to find that $x_N\cdot x_P=a^2$ still holds.

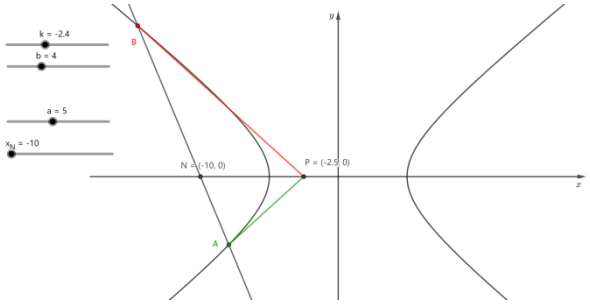

Figure 5

Limiting space, the proof of this conclusion in hyperbolas is left to the interested reader.

As the mathematician Polya said, good problems are somewhat similar to certain mushrooms, they all grow in heaps, after finding one, you should look around, there are probably several nearby[1] . Teachers in the teaching process, should be good at guiding students to a good problem to carry out variations of the investigation, so as to achieve the effect of the point to bring about the surface, less than more than the effect.

3. Conclusion

In this paper,we use GeoGebra software to conduct a dynamic investigation of the problem of slope summed to zero in conic curves, thus conjecturing and arguing generalized mathematical conclusions.Through demonstration, observation, discovery, conjecture, proof, and analogy from parabola to ellipse and hyperbola, students are directly involved in the whole process of inquiry and construction of conclusions, which is conducive to the development of the students' ability of independent inquiry, analogy and reasoning, and enables students to master the method of researching the problem from the particular to the general[2].

In the era of "Internet +", the wide application of information technology is having a profound impact on mathematics education[3]. With the help of GeoGebra software, it is easy to explore mathematical problems in depth intuitively and from multiple perspectives, giving full play to students' initiative, enthusiasm and creativity, effectively enhancing students' interest in learning, expanding students' mathematical thinking, and providing an effective way of exploring and understanding new knowledge .

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Digital Era Cultural Heritage: The Role and Impact of Virtual Museums

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Abstract: This paper examines virtual museums' role in preserving cultural heritage and education in the digital age. Using VR and AR, virtual museums overcome physical limits of traditional museums, offering an immersive, anytime, anywhere experience. This boosts cultural heritage accessibility, engagement, and artifact preservation. Their educational applications are also noted for interdisciplinary learning. Yet, with rapid technological growth, virtual museums face challenges like technological updates, data security, and privacy. The study underscores the importance of virtual museums in protecting and passing down cultural heritage in the digital era, and their value to society and education.

Keywords: Virtual Museum; Cultural Heritage; Digital Era; Educational Innovation; Challenges and Opportunities

1. Introduction

In the digital age, technology has shifted perspectives on cultural heritage and education. Traditional museums face digitalization challenges, but virtual museums, using VR, AR, and interactive multimedia, have emerged to revitalize cultural heritage, offering global, anytime access and immersive experiences. They also foster educational innovation, enriching learning with diverse materials. Virtual museums blend heritage with technology, preserving tradition while meeting digital needs, bringing new challenges and opportunities to society (Schweibenz, 2019).

The digital age has greatly affected cultural heritage and traditional museums, but virtual museums now expand global access to history, art, and science online. Balancing authenticity with interaction is key, using VR and AR for engagement. Museums must integrate technology carefully to adapt to the digital landscape, facing digitization, authenticity, and conservation challenges. Navigating these will determine their relevance in our digital world (Bachi et al., 2014).

This study examines virtual museums' crucial role in cultural heritage amidst the digital age, assessing their impact on society and education. Focusing on how virtual museums convey, preserve, and present cultural heritage digitally, the research aims to uncover their distinct contributions. Additionally, it explores virtual museums' effects on cultural dissemination, societal engagement, and educational practices, especially in student learning and curriculum integration. By addressing these aspects, the study aims to offer insights for the future development of virtual museums, cultural heritage preservation, and educational innovation in the digital era.

2. The Rise and Development of Virtual Museums

Virtual museums are digitized platforms that use cutting-edge technologies to present cultural artifacts in an immersive online environment, reimagining the traditional museum experience. They overcome physical boundaries, allowing global access to cultural treasures. These museums digitize, preserve, and innovatively showcase cultural heritage, enabling deep exploration of human history and creativity (Borda & Bowen, 2021).

Key features include digital accessibility, offering universal access; immersive technology like VR and AR for engaging experiences; multimedia integration with videos and 3D models; user-centric exploration; educational integration with learning materials; and dynamic content updates for timely presentations. Virtual museums are evolving to include intelligent services like smart guidance and personalized recommendations, enhancing the user experience. Their fusion of technology and culture promises a bright future for virtual exploration and education.

The emergence of virtual museums represents a notable change in safeguarding and disseminating cultural heritage in the digital era. Utilizing digital technology, they immerse visitors in historical artifacts, bridging time gaps. This enhances learning and engagement, par-

ticularly in educational settings, where it fosters students' interest and abilities. Challenges include maintaining technology and safeguarding data, but virtual museums have still revolutionized access to cultural heritage, emphasizing education and innovation. Their influence on our cultural landscape will persist as technology evolves.

3. The Key Role of Virtual Museums in Cultural Heritage

Virtual museums, as contemporary tools for cultural heritage preservation in the digital age, play a pivotal role in the field of cultural heritage. A comprehensive understanding of their significance can be achieved by delving into their effectiveness in conveying, preserving, and exhibiting cultural heritage, along with their unique contributions in digital display, interactive experiences, and artifact digitization(Sylaiou & Fidas, 2022).

Virtual museums, using digital displays, have revitalized our engagement with cultural heritage, bringing the past to life. They replicate authentic artifacts interactively, revealing rich details and histories. Surpassing traditional exhibitions, they offer immersive experiences, global access, and cultural understanding. Virtual museums are not just storage but drivers of cultural diffusion, engaging diverse audiences. As technology progresses, their role in preserving and promoting our cultural legacy will grow (LO TURCO et al., 2020).

Virtual museums are essential for cultural heritage, enhancing public awareness and conservation consciousness. Their innovative displays and interactive features offer an immersive gateway to human history, presenting our rich cultural legacy in an accessible and engaging way. These platforms deepen our understanding of heritage value and vulnerability, fostering appreciation and respect. They also promote cultural conservation and sustainability values, guiding individuals to actively protect our shared cultural wealth. Virtual museums are not just digital repositories but agents of social change, transforming how we engage with heritage and paving the way for a more sustainable and inclusive cultural future (Ganatsios et al., 2021).

Virtual museums, as global cultural hubs, overcome physical barriers, embracing global connectedness. Technology gives worldwide audiences access to diverse cultural stories, fostering understanding and connection. Experts collaborate on conservation, knowledge-sharing, and innovation. Beyond heritage, these platforms promote diplomacy and unity, linking past and present, nations and people. Their potential grows as we embrace a digital future (Wihlborg et al., 2018).

4. Comprehensive Impact of Virtual Museums on Society and Education

Virtual museums, with their digital versatility, are now essential to modern culture and education. They showcase heritage and art online, while leading societal and cultural progress. Using advanced technology, they overcome physical limits, digitize exhibits for public access, and ensure the enduring sharing and preservation of cultural treasures (Sylaiou et al., 2017).

Virtual museums, through digitization, have become crucial to cultural heritage and education. They display cultural treasures globally, overcoming traditional limits and enhancing cultural exchange and understanding. In education, they offer immersive, interactive learning with VR/AR, making history vivid and boosting student engagement. Virtual museums also foster interdisciplinary learning and innovation, leading a new era in accessible, high-quality education and heritage, promoting personal and comprehensive development (Liu & Shalaby, 2024).

Virtual museums, leveraging advanced digital technologies, have become vital for preserving cultural heritage. They replicate and showcase artifacts with high fidelity, making them accessible globally and engaging audiences through immersive experiences. However, these platforms also face security and long-term storage challenges. Robust security measures and sustainable storage solutions are crucial to safeguard digital artifacts for future generations. In summary, virtual museums play a key role in cultural preservation, but addressing their challenges is essential to ensure the protection of our cultural treasures (Nilson & Thorell, 2018).

Virtual museums have had a significant impact on both cultural heritage and the tourism industry. By offering previews of destinations' cultural atmospheres through immersive technologies, they attract and engage tourists, fostering informed travel decisions. This reduces physical visits, promoting sustainable tourism and preserving cultural resources. Personalized and interactive elements enhance the overall tourism experience. In conclusion, virtual museums shape the future of tourism, protecting cultural heritage while revolutionizing travel experiences (Buhalis & Zoge, 2007).

Virtual museums, as advanced educational tools, enrich student experiences across subjects. In History, they immerse students in key moments and cultural shifts through digital artifacts and interactive features. For Art Education, VR showcases artworks, deepening appreciation. In Sciences, they simulate experiments, demonstrate principles, and trace scientific evolution, enhancing understanding and curiosity. For Humanities, virtual museums explore diverse themes, fostering critical thinking. Their integration into education elevates learning, revolutionizing traditional teaching practices and embracing innovation.

5. Conclusion and Future Prospects

With technology's progress and digitization, virtual museums have become multidimensional platforms merging time, space, and experience. Beyond archives, they're dynamic centers where history, futurism, tangibility, intangibility, education, and entertainment intersect. In brief, virtual museums redefine cultural heritage understanding, offering endless exploration and learning. They'll shape global cultural engagement and education's future as they evolve.

Despite the comprehensive exploration of the role and impact of virtual museums, there are still limitations and areas for improvement. For instance, further empirical research is needed to validate the actual effectiveness and long-term impact of virtual museums in specific application scenarios. Looking ahead to the future of virtual museums, we envision several key areas where significant breakthroughs can be made to further enhance their value and impact.

Technological advancements offer great potential for virtual museums, promising more advanced and user-friendly designs that enhance the experience, including improved VR and AR for immersion, and AI/ML for personalization. Content enrichment is key, showcasing broader cultural heritage, exploring underexposed topics, and collaborating with local communities for diverse views. Collaborative applications expand virtual museums' influence, partnering with institutions for heritage protection, resource sharing, and improved access, safeguarding human history and culture for the future.

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Psychological Healing: a Theoretical Exploration of the Effects of Horticultural Therapy on College Students' Subjective Well-Being

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Abstract: The purpose of this study was to examine how horticultural therapy affects the subjective well-being of college students. Through theoretical analysis and literature review, the study focused on the role of horticultural therapy in mental health promotion, emotion regulation, self-efficacy enhancement, and creativity and cognitive function enhancement. It was found that horticultural therapy can significantly improve the mental health of university students, especially in stress management and emotional stability. Participation in horticultural activities helped to increase students' life satisfaction, reduce negative emotions, and enhance their self-efficacy and sense of achievement. In addition, horticultural activities have been found to promote creative thinking and cognitive development. Nonetheless, there are challenges to implementing horticultural therapy, including resource and space constraints, and inconsistent participation. This study proposes that integrating horticultural therapy in a university setting requires a combination of resource allocation, curriculum design, and interdisciplinary collaboration. In summary, horticultural therapy demonstrates the potential to be an effective tool for enhancing the subjective well-being of university students, but its successful implementation requires further strategic planning and research.

Keywords: Psychological Healing; Horticultural Therapy; University Students; Subjective Well-Being

1. Introduction

Horticultural therapy, i.e. therapy through gardening, is an integrated intervention that combines the natural environment with psychological healing. The theoretical basis of this therapy is the deep connection between humans and nature, the concept of "nature healing". Research has shown that interaction with nature can significantly reduce psychological stress, improve emotional states and enhance mental health. In this context, gardening activities, as a way to get closer to nature, provide individuals with a unique opportunity for relaxation and self-expression.

The effectiveness of horticultural therapy lies not only in the fact that it provides individuals with a psychological experience that is different from their everyday environment, but also in the physical activities involved. Research indicates that horticultural activities such as planting, pruning and garden design not only enhance physical health, but also promote positive psychological development, such as increased self-efficacy, enhanced creativity and improved psychological resilience.

However, while the benefits of horticultural therapy in the general population have been widely recognised, little research has been conducted on its impact on specific groups, such as university students. This particular group of college students faces unique psychological developmental tasks and challenges due to their life transitions. Therefore, exploring the effects of horticultural therapy on college students' subjective well-being is not only important for research in the field of mental health, but also provides new perspectives and strategies for practical mental health interventions.

2. Overview of horticultural therapy

2.1 Definition and history

Definition: Horticultural therapy, often defined as the use of horticulture and plant care activities as a therapeutic tool to promote the physical and mental health of participants. This therapy combines the care of plants and the learning of horticultural skills to enhance an individual's psychological well-being, social skills, physical health, and cognitive functioning.

Historical Background and Development:The history of horticultural therapy dates back to ancient times when the therapeutic value of

interacting with nature was recognised. However, as a formal therapeutic approach, horticultural therapy was developed in Europe and North America in the late 19th and early 20th centuries. Initially, it was used primarily in rehabilitation services, particularly during the First and Second World Wars, for the recovery of war wounded. Over time, the application of horticultural therapy has gradually expanded to include a variety of fields, including mental health, rehabilitation medicine, geriatrics and special education.

2.2 Implementation modalities

Different forms of delivery: Horticultural therapy can be delivered in a variety of ways that can be adapted to the specific needs and circumstances of the participant. Some common forms include:

Individual therapy: In this model, therapy is designed for the individual participant to meet his or her specific physical and mental health needs. This approach allows the therapist to monitor and adjust the treatment plan more closely.

Group therapy: In group therapy, a group of people participate in gardening activities together. This modality not only promotes social interaction, but also provides opportunities for teamwork and helps to build a sense of community and belonging.

Rehabilitative Horticulture: this form of horticultural therapy focuses on physical and cognitive rehabilitation. Through horticultural activities, participants can improve physical function and coordination, as well as cognitive abilities.

Community gardening projects: These projects are usually aimed at a wider group of people, such as community members or school students. They provide a means of community involvement while promoting environmental protection and awareness of sustainable development.

Characteristics: The different forms of delivery of horticultural therapy each have their own characteristics. Individual therapy offers more individualised and focused treatment, while group therapy focuses on socialisation and teamwork. Rehabilitative horticulture is appropriate for individuals who need specific physical or cognitive rehabilitation, while community gardening projects focus more on community involvement and environmental education. These different modes of delivery allow horticultural therapy to be flexible and adaptable to the needs of different populations and environments.

3. The link between horticultural therapy and subjective well-being

3.1 Mental health impacts

The impact of horticultural therapy on an individual's mental health is multifaceted, and is particularly notable in the areas of mood regulation, stress management and overall mental health. Firstly, horticultural activities help individuals to withdraw from stressful study or work pressures by providing a relaxing environment that is different from everyday life. For example, participants can shift their attention to specific gardening tasks while tending to plants, thus achieving emotional diversion and relaxation.

In addition, horticultural therapy has been found to help improve emotional regulation. Creative and fulfilling tasks in horticultural activities, such as planting, pruning, or designing a garden, can provide positive feedback and a sense of accomplishment, which can have a positive impact emotionally. These activities not only reduce negative emotions, such as anxiety and sadness, but also enhance an individual's sense of well-being and self-worth.

3.2 Social interaction and sense of belonging

Horticultural therapy has shown its unique value in promoting social interaction and enhancing a sense of belonging as well. Through group participation in horticultural projects, such as community gardens or school gardening clubs, individuals not only share gardening experiences, but also build new social relationships during the activities. Such shared experiences and goals help to build a spirit of teamwork and enhance mutual understanding and support within the community.

Participation in gardening activities can also enhance an individual's sense of belonging to the community. Taking care of a garden or green space project together can make participants feel that they are an important part of the community and that their efforts contribute positively to the improvement of the environment and the beautification of the neighbourhood. In addition, the shared fruits of gardening activi-

ties, such as jointly planted gardens or harvested fruits and vegetables, can enhance a strong bond and sense of solidarity among community members.

4. Influencing factors of college students' subjective well-being

4.1 Components of subjective well-being

Subjective well-being is a multidimensional concept involving an individual's subjective assessment of life satisfaction and the experience of positive and negative emotions. It typically consists of the following three core elements:

Life satisfaction: this refers to an individual's evaluation of his or her life as a whole, including satisfaction with personal achievements, relationships, work and study.

Positive Emotions: this covers positive emotions that the individual experiences on a regular basis, such as happiness, excitement, contentment and love.

Negative emotions: these include frequently experienced negative emotions such as sadness, anger, anxiety and depression. Subjective well-being involves not only reducing the experience of these negative emotions, but also increasing the experience of positive emotions.

4.2 Characteristics of subjective well-being of university students

For the special group of college students, their subjective well-being has some unique characteristics:

Challenges of life transitions: University students are at an important stage of transition from adolescence to adulthood. This stage is accompanied by changes in identity, choices of future careers and adaptation to new social roles, all of which may have an impact on their well-being.

Academic stress: Stress over academic performance and future career prospects is an important factor in the well-being of university students. This stress can lead to feelings of anxiety and stress, which can affect their overall well-being.

Changes in Interpersonal Relationships: College students experience important changes in their interpersonal relationships during this period, including the formation of new friendships and the adaptation of old relationships. These interpersonal interactions have a significant impact on their well-being.

Self-exploration and personal growth: Self-exploration and personal growth during the college years are critical to their subjective well-being. Self-understanding, value formation and the establishment of life goals are all key tasks at this stage.

5. The effect of horticultural therapy on college students' subjective well-being

5.1 Mental health and emotional stability

Horticultural therapy has a significant positive impact on the mental health and emotional stability of university students. By engaging in horticultural activities, students are able to relax in a natural environment, thereby reducing the stress of school and life. This interaction with nature can serve as an effective stress-release mechanism, helping students to temporarily detach themselves from the anxieties and tensions of everyday life. Horticultural activities, such as planting, pruning and garden design, require students to focus on the task at hand, thus providing a "mind-flow" experience, which contributes to emotional stability and a sense of well-being. In addition, the sense of achievement and expression of creativity in horticultural activities are key factors in enhancing mental health.

5.2 Self-efficacy and sense of achievement

Horticultural activities have also been found to enhance college students' self-efficacy and sense of accomplishment. By successfully caring for plants, students can experience the satisfaction of growing the entire process from start to finish. This experience not only boosts their confidence in their abilities, but also enhances their sense of control over their lives. For example, when students see the plants they have grown thrive, they feel a sense of pride and accomplishment, which contributes to their self-esteem and sense of self-worth. These positive effects of horticultural activities are vital in enhancing an individual's subjective well-being.

5.3 Creativity and Cognitive Functioning

Participation in horticulture also helps to enhance the creativity and cognitive functioning of college students. Gardening is not only a physical activity, but also one that requires planning, judgement and problem solving. For example, designing a garden requires creative thinking and spatial planning skills, and these activities stimulate students' creativity and innovative thinking. In addition, attention to detail and observation of plant growth cycles in horticultural activities improve students' concentration and cognitive awareness. The enhancement of these skills is not only beneficial for academic achievement, but also has a significant impact on an individual's overall cognitive development and creativity building.

6. Discussion

6.1 Challenges in the application of horticultural therapy

Although horticultural therapy has shown potential to enhance the subjective well-being of university students, there are still a number of challenges and limitations to implementing this therapy in a university setting. Firstly, space and resource constraints are a major issue. Not all universities have sufficient space to establish and maintain gardens or other horticultural facilities, especially not in urban universities. In addition, horticultural therapy requires specific material resources such as plants, soil and gardening tools, which may require additional financial support.

A second challenge is the issue of participation. While horticultural therapy may be very appealing to some students, others may not be interested or motivated to participate. In addition, students' schedules and academic pressures may limit their ability and desire to participate in horticultural activities.

7. Policy recommendations and practical guidance

To effectively integrate horticultural therapy in higher education, the following are some suggestions and strategies:

Resource allocation and space utilisation: Universities should consider incorporating horticultural spaces such as rooftop gardens, small community gardens or indoor plant walls in campus planning. This will not only help provide space for horticultural activities, but also beautify the campus environment.

Curriculum integration and workshops: Horticultural therapy can be offered as part of the formal curriculum or as informal workshops and club activities. By integrating horticulture into students' curricula and activities, their engagement can be increased.

Interdisciplinary Collaboration: Horticultural therapy can be used as an interdisciplinary project, incorporating fields such as psychology, environmental science, and the arts. Such collaborations can enrich horticultural therapy and make it more engaging.

Student-led projects: Students are encouraged to participate in the design and implementation of horticultural projects to increase their engagement and sense of belonging. Student-led projects also help to ensure that activities are tailored to their interests and needs.

Continuity and sustainability: It is important to ensure the continuity and sustainability of horticultural projects. This includes ensuring the long-term availability of funding and resources, as well as supporting student and staff participation through education and training.

Conclusion

This study provides a comprehensive examination of the role of horticultural therapy in enhancing the subjective well-being of college students. It was found that horticultural therapy positively impacted several aspects of college students' mental health, emotional stability, self-efficacy, achievement, creativity, and cognitive functioning. By engaging in horticultural activities, students can find a way to relax and escape from daily stress in a natural environment, which has a significant effect on relieving stress and improving emotional stability in academics and life. In addition, horticultural activities help to enhance students' self-efficacy and sense of achievement. By participating in horticultural projects, students are able to see the results of their efforts, which enhances their self-esteem and sense of self-worth. At the same time, horticultural activities stimulated students' creativity and cognitive functions, which are important components of subjective well-being.

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Practice and Exploration of Secondary Vocational Students' Post Practice Education

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Abstract: Post internship is a way for students to participate in production work directly after learning knowledge and skills, which is of great significance for students' future employment and development. As a place to train high-quality and skilled talents, on-the-job practice is an important link in education and an important way to complete the talent training program. In order to effectively improve students' mastery of professional knowledge and complete the cultivation of students' good quality and professionalism, secondary vocational colleges should actively lead students to carry out on-the-job internships, so as to effectively promote the development of students and the construction of secondary vocational colleges.

Keywords: Secondary Vocational Colleges; Post Internship; Corporate Culture; Moral Education Management

Introduction

The issue of student employment is a hot topic in the current society, and employment is an important issue that students need to face in the future. The severe employment situation brings great pressure to students in vocational colleges. In order to ease the employment pressure of students and improve the quality of talent training, secondary vocational colleges actively innovate the talent training model and carry out on-the-job internship to provide guarantee for the development of students. Due to subjective, objective and other factors, the implementation of on-the-job practice in secondary vocational colleges has been hindered to some extent. Teachers should clarify the current situation of on-the-job practice education, actively innovate educational methods, effectively improve the quality of talent training, and promote the all-round development of students.

1. Current situation of post practice education for secondary vocational students

1.1 The school does not pay enough attention to the internship

School is an important place to carry out education and teaching, not only to provide security for students' study and life, but also to lay the foundation for students' future development. Some secondary vocational colleges believe that the ultimate goal of students' study is employment, so they take the initiative to strengthen the cooperation between secondary vocational colleges and enterprises, actively provide students with a platform for on-the-job internship, and provide a solid guarantee for students' future development. However, some schools ignore the characteristics of secondary vocational colleges, excessively pursue the enrollment rate of students, and encourage students to improve their academic qualifications [1] Therefore, there are some problems in leading students to carry out internship time, tasks and evaluation methods, which have a certain impact on students' promotion.

1.2 Students' participation in post internship is not high

The purpose of secondary vocational colleges to carry out post practice education is to encourage students to participate in the process of post practice and complete the cultivation of students' ability. Some students of secondary vocational colleges actively participate in the internship arranged by students, and master relevant knowledge and skills through phased internship, laying a good foundation for students' future employment and development. However, some students are seriously affected by the current social employment form, and believe that only by constantly enriching their knowledge and improving their academic qualifications can they enhance their competitiveness in the society. Of course, students have certain significance for the future planning, but they need not only professional knowledge but also professional ability to establish themselves in the society, so as to enhance their competitiveness. Because of various reasons, students avoid the tasks of

post practice and take a negative attitude towards it, which has a serious impact on the development of students' comprehensive ability.

1.3 The teacher fails to give corresponding guidance and education to the students

Post internship means that students go out of campus to carry out related work in enterprises, and complete the cultivation of students' ability through labor training and other forms. Students in secondary vocational colleges are in the stage of adolescence, and their abilities in all aspects are in the process of development. They do not have a thorough understanding of external things. Therefore, the guidance and education of teachers is particularly important when students go to enterprises for post practice. Teachers should not only pay attention to students' practice situation, but also pay attention to students' mental health, so as to promote students' healthy development [2] Teachers pay due attention to students when carrying out on-the-job practice education, actively communicate with students to understand their work conditions, but ignore students' psychological problems and fail to give timely guidance to students' psychological problems arising from the practice process. If this goes on in the long run, it will have an impact on students' development. Teachers should follow the development rules of students, be good teachers and helpful friends of students to give students corresponding guidance, so that students can gradually adapt to the task of on-the-job practice, and improve their professional ability and accomplishment.

2. The educational significance of post practice for secondary vocational students

2.1 Help students understand corporate culture

The purpose of education in secondary vocational colleges is to continuously transport high-quality and high-level professional and technical talents for the society, so as to contribute their own strength to the continuous development of social economy. Therefore, students need to master professional knowledge and professional skills through study to lay a good foundation for future employment. On-the-job internship is a way for students to study and practice in enterprises supported by school-enterprise cooperation, which is of great significance to the development of students' ability. In addition, on-the-job internship education for secondary vocational students is conducive to helping students fully understand the corporate culture, so that students have a preliminary understanding of the future work, which is of great significance to the future development of students.

2.2 Enhance students' social practice experience

Practice is an important way for students to broaden their vision, broaden their knowledge and accumulate experience. As an important way to train talents in secondary vocational colleges, on-the-job internship is not only a form of labor training, but also an effective way for students to enhance their own social practice experience. On-the-job internship can not only help students consolidate knowledge and accumulate practical experience, but also communicate and exchange with others in the work, effectively completing the cultivation of students' interpersonal skills. Secondary vocational students' on-the-job internship education is conducive to helping students enhance social practice experience, constantly accumulate work skills and methods, and lay a good foundation for students to participate in work in the future.

2.3 Cultivate students' good spiritual quality

The students of secondary vocational colleges are in the stage of adolescence, which is the key period to cultivate students' correct values and good quality. After students finish learning professional knowledge on campus, they enter enterprises for on-the-job internship. Working together with enterprise employees is of great significance to the development of students' ability. At the same time, when students communicate with enterprise employees, they can imperceptitiously cultivate students' good qualities such as hard work, diligence and bravery. Make the students become excellent talents with high quality and high level. Secondary vocational students' internship education not only lays a good foundation for the development of students, but also completes the cultivation of students' good spiritual quality, so that students have the ability to stand in the society.

3. Secondary vocational students post practice education practice

3.1 Strengthen ideological education and change students' concepts

Students' participation in post practice is not high, and the lack of attention is an important factor affecting the development of post practice education. In order to improve the current situation of students' on-the-job internship in secondary vocational colleges, colleges and universities should strengthen ideological education for students, actively infiltrate the importance of on-the-job internship to students' future development, fundamentally change students' concepts, and guide students to actively participate in the process of on-the-job internship. Complete the cultivation of students' knowledge and ability. [3]

In order to change the idea of students, the secondary vocational colleges should strengthen the ideological education of students. Secondary vocational schools can fully combine the characteristics of students, actively organize themed activities, exchange meetings and lectures related to post internship for students, invite teachers responsible for post internship or career guidance teachers to organize meetings, and actively infiltrate the importance of post internship to the future development of students. Through participating in various conferences, students gradually change their own ideas and realize the importance of on-the-job practice for future development, so as to actively participate in the process of internship and continuously improve and develop themselves.

3.2 Strengthen school-enterprise cooperation and provide internship opportunities

Post internship is based on the cooperation between vocational schools and enterprises, students go into the enterprise to practice and work, to create benefits for the enterprise at the same time, personal development. Secondary vocational colleges should clarify their own school-running characteristics and professional work direction, and actively communicate with local or surrounding enterprises, so as to reach a consensus on school-enterprise cooperation. Through strengthening cooperation between schools and enterprises, secondary vocational schools continue to provide internship opportunities for students, so that students can participate in the internship process and constantly improve their own ability.

Secondary vocational schools should actively provide internship opportunities for students and strengthen cooperation with enterprises. For example, in the nursing major of secondary vocational colleges, school leaders should clarify the employment direction of nursing students, and actively communicate with local hospitals, medical institutions and other enterprises, so as to reach a friendly cooperative relationship and transfer nursing students to hospitals and other enterprises. The strengthening of school-enterprise cooperation provides students with the opportunity to practice, and students actively participate in the internship and constantly improve themselves.

3.3 Improve the training program and encourage on-the-job internship

Post internship is an important way for secondary vocational colleges to complete the talent training program, and it is also the main way to improve students' ability. In order to promote students to actively participate in the process of post internship, secondary vocational schools should actively improve the talent training program, incorporate post internship into the talent training program, and actively innovate the evaluation mechanism, encourage students to participate in post internship, and complete the training of students. Perfecting the talent training program provides a new idea for teachers to carry out teaching, and provides a solid guarantee for the continuous development of students.

In order to encourage students to participate in post internship, secondary vocational colleges should actively improve the talent training program. Secondary vocational college students usually participate in post internship in the last year of school, laying the foundation for students' future employment. Secondary vocational schools can divide post practice into courses and set up corresponding credits and instructors. Under the guidance of teachers, students can successfully complete the internship tasks within the specified time and obtain the corresponding credits, so as to complete the internship education. Improving the talent training program is an important way to encourage students to participate in the internship. Secondary vocational colleges should start from the aspects of students' majors and abilities to complete the training of students.

Conclusion

In summary, on-the-job practice is an important way to carry out education and teaching in secondary vocational colleges, and it is also an important strategy to complete talent training. Secondary vocational colleges should pay more attention to post practice, actively carry out

post practice education to strengthen students' ideological education and change students' ideological concepts; Strengthen cooperation with enterprises and provide internship opportunities for students; Improve the talent training program and innovate the evaluation mechanism, encourage students to participate in the internship, complete the knowledge learning and personal ability improvement. As an important factor in teaching, teachers should pay attention to students, pay attention to the development of students' mental health and moral education, and comprehensively improve the quality of talent training in secondary vocational colleges.

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Analysis of English Teaching Mode Innovation in Colleges and Universities under the Perspective of Big Data

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Abstract: This article discusses in depth the innovation strategy of English teaching mode in colleges and universities under the perspective of big data, aiming at solving the challenges faced by the traditional teaching mode in the era of information technology. The article firstly puts forward the main problems existing in the current English teaching in colleges and universities, including the dispersion of learning resources, students' insufficient knowledge of English learning and inappropriate learning methods. Subsequently, three major innovative strategies are proposed: using big data to optimise the design of personalised learning paths, constructing data-driven teaching content and assessment systems based on data, and promoting the integration of collaborative learning and practical applications. Through real-life case studies, the paper demonstrates how these strategies can be implemented in concrete terms and discusses their positive impacts on improving teaching efficiency, enhancing learning experiences, and fostering students' comprehensive English application skills. Finally, it summarises the important role of big data technology in the innovation of English teaching in colleges and universities, and looks forward to the future development trend of the teaching model. This paper provides innovative ideas and practical guidance based on big data technology for the field of English teaching in colleges and universities, aiming to promote the continuous improvement of education quality and optimisation of learning effects.

Keywords: Big Data; College English; Teaching Mode; Innovation Inquiry

Introduction

In the context of the digital era, big data technology is gradually becoming an important driving force for innovation in the field of education. Especially in English teaching in colleges and universities, big data not only provides the possibility of in-depth understanding of the learning process, but also opens up new ways for the design and implementation of personalised teaching strategies [1]. With the continuous advancement of technology and the increasing diversity of teaching needs, the traditional English teaching model is facing unprecedented challenges and opportunities. This background has prompted educators and researchers to seek innovative teaching models to adapt to the rapidly changing educational environment and learners' individual needs. In this paper, we will discuss the innovation of English teaching mode in colleges and universities under the perspective of big data, focusing on the analysis of strategies to optimise teaching design, improve teaching quality and learning efficiency using big data.

1. Difficulties Facing English Learning of Students in Colleges and Universities

1.1 Fragmentation and information overload of learning resources

In the contemporary educational environment, one of the major dilemmas commonly encountered by students in colleges and universities in the process of English learning is the dispersion of learning resources and information overload. This phenomenon stems from the rapid development of Internet technology, which has greatly enriched teaching resources but also brought about the difficulties of information screening and absorption [2]. When students are faced with a huge amount of English learning materials, it is often difficult for them to identify the quality of the resources, and it is easy for them to get lost in the disorderly information, which not only affects the learning efficiency, but also aggravates the psychological burden of learning. More critically, this dispersion of resources and information overload challenges the effectiveness of traditional teaching models and learning methods. The lack of effective guidance and screening mechanisms for students in the process of independent learning makes it easy for them to form one-sided understanding of knowledge and mastery of skills, making it difficult to achieve the cultivation goals of deep learning and critical thinking. Therefore, how to navigate effectively in the ocean of informa-

tion has become a key challenge to improve the quality of English teaching and learning effectiveness.

1.2 Insufficient awareness of English language learning among students in higher education

In the current higher education system, English, as a globally common language, has a non-negligible impact on students' future academic research and career development. Many students in higher education have insufficient awareness of the importance of English learning, a phenomenon reflected not only in students' lack of motivation to learn English, but also in their underestimation of the role of English proficiency enhancement in their personal development [3]. This situation seriously restricts the initiative and depth of students' English learning, which in turn affects the comprehensive improvement of their language skills and the broadening of their international horizons. An in-depth analysis of the reasons for this can be attributed to the inadequacy of English education in colleges and universities in terms of curriculum design and teaching methods, as well as the lack of effective strategies to closely integrate English learning with students' career planning and personal interests. English teaching focuses too much on the inculcation of grammatical rules and test-taking skills, ignores the importance of English as a communication tool in practical application, and fails to fully stimulate students' interest in learning and enthusiasm for practice.

1.3 Inappropriate English learning methods for college students

At the higher education level, the appropriateness of English learning methods has a decisive impact on students' language mastery, and the improper choice of methods in the process of English learning by college students can seriously hinder the improvement of their language skills and the optimisation of their learning efficiency. Many students rely on the traditional, teacher-centred test-taking teaching mode, ignoring the interactivity and practicality of English learning [4]. In addition, students tend to favour mechanical memorisation of vocabulary and grammatical rules and lack practice and reflection on the use of language in real contexts, which leads to the uneven development of their abilities in all aspects of listening, speaking, reading and writing. In the face of this challenge, English education in colleges and universities needs to fundamentally change its teaching philosophy and adopt more flexible and diversified teaching methods.

2. The strategy of English teaching mode innovation in colleges and universities under the perspective of big data

2.1 Optimising the design of personalised learning pathways using big data

In the big data perspective, the innovation of English teaching mode in colleges and universities is a revolution in the concept of education. The use of big data to optimize the design of personalized learning paths is essentially a way to provide customized learning experiences through in-depth analysis of students' learning behaviours, preferences and achievements. This approach ensures that teaching strategies are highly matched to the actual needs of students, thereby dramatically increasing the effectiveness and efficiency of learning. Under this philosophy, educators can more accurately identify each student's strengths and weaknesses, and tailor the most appropriate learning materials and activities for them, thus realising personalised teaching in the true sense of the word.

A university uses big data technology to collect and analyse data on students' online learning behaviours, including the distribution of study time, course completion, and correctness of exercises. Based on these data, the university developed an intelligent recommendation system that can dynamically adjust the content and difficulty of learning based on students' learning progress and performance. For students with faster mastery, the system recommends more difficult materials and deep learning tasks [5]; for areas that need to be strengthened, the system provides additional exercises and review materials. In addition, the system can recommend relevant English learning resources according to students' interests, e.g., students who like music will receive tasks for analysing English songs, and students who like sports may receive reading materials for English sports news. This personalised learning path design not only enhances students' motivation to learn, but also significantly improves the practical application of English learning.

The strategy of using big data to optimise personalised learning paths provides an innovative solution for teaching English in higher education. It not only reflects the advancement of educational technology, but also a deep understanding of and respect for students' individual differences. Through this approach, students are able to master English more efficiently in a learning environment that is more attuned to

their individual needs and interests, so that they can better cope with the challenges of the era of globalisation.

2.2 Building a data-driven pedagogical content-based and assessment system

In the wave of educational innovation led by big data technology, building a data-driven teaching content and assessment system has become an important strategy for the innovation of English teaching mode in colleges and universities. The core of this strategy lies in the precise collection and analysis of students' learning data, so as to achieve personalised adjustment of teaching content and accurate assessment of teaching effects. Through real-time analysis of students' behaviour, performance and feedback in the learning process, teachers can gain insight into each student's learning needs and progress, and further optimise the teaching plan so that it is closer to students' actual abilities and interests. This approach not only improves the relevance and effectiveness of teaching, but also greatly enhances students' learning experience and satisfaction.

A university implemented an English teaching platform based on big data analysis, which is capable of tracking students' learning activities, such as the completion of online exercises, the frequency of classroom interactions, and the quality of homework submissions, etc., and analysing these data through algorithms to identify students' learning blind spots and points of interest [6]. Based on the results of these analyses, the platform automatically recommends personalised learning resources and practice questions for each student, as well as providing targeted learning advice. In addition, teachers are able to make timely adjustments to their teaching strategies through the data analysis reports obtained by the platform, such as arranging tutoring sessions for students with slow learning progress or fine-tuning the course content to adapt to changes in the student population.

The construction of a data-driven teaching content and assessment system based on data can greatly enhance the personalisation and accuracy of teaching, and also effectively promote the optimal allocation of teaching resources and the innovation of teaching methods. It strongly promotes the improvement of the quality of English education in colleges and universities, and provides students with a more scientific, efficient and dynamic learning environment. In the future, with the continuous progress of big data technology and the updating of educational concepts, this data-driven teaching mode will show a broader application prospect.

2.3 Promoting the integration of collaborative learning and practical applications

Promoting the integration of collaborative learning and practical application is based on the recognition that the essence of language learning lies not only in the mastery of grammar rules and vocabulary, but also in the ability to apply what has been learnt in real-world communication situations. Collaborative learning emphasises group work to complete tasks and promote communication and cooperation among students, while practical application combines learning content with real-world situations to improve students' practical application skills. Big data technology plays a crucial role in this process by analysing students' learning behaviours, interaction patterns and outcomes, providing teachers with insights into students' needs and a basis for adjusting teaching strategies.

A university has adopted a big data-based English teaching system that tracks student interaction data on an online collaborative learning platform, such as the activity of discussions, the completion of team tasks, and students' participation in specific topics [7]. Based on these data, the system is able to automatically recommend partners for students, form efficient collaborative learning groups, and customise and recommend practical projects based on students' performance and preferences. For example, for groups of students who show a strong interest in business English, the system will recommend them to participate in a simulated international trade negotiation project, which includes real-time online meetings, business report writing, and project presentations, aiming to enhance their English application and teamwork skills.

In conclusion, by combining collaborative learning with practical applications and leveraging the powerful analytical capabilities of big data technology, the effectiveness of English language teaching in colleges and universities and the learning experience of students can be greatly enhanced. This strategy promotes mutual support and sharing among students, and also enables them to exercise and demonstrate their language skills in real-life application scenarios, laying a solid foundation for their future academic and professional careers.

Conclusion

The application of big data technology in the field of English teaching in colleges and universities has opened up new paths, making the teaching content and assessment system more scientific and personalised, while promoting the deep integration of collaborative learning and practical application. This innovative teaching mode not only improves teaching quality and learning efficiency, but more importantly, it cultivates students' critical thinking ability, problem-solving ability, and intercultural communication skills, laying a solid foundation for their future academic development and career. In the future, with the further development of technology and the continuous innovation of education model, the college English teaching model based on big data will show a broader development prospect and make greater contributions to the development of global education.

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An Adaptive Algorithm for Workpiece Edge Detection Combining Morphology and Canny Operator

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Abstract: Addressing the challenges of limited noise suppression, inaccurate edge detection, and poor adaptability encountered in the detection of workpiece image edges in complex industrial environments, this study introduces an adaptive algorithm for edge detection that integrates morphological processing with the Canny operator. Firstly, a weighted adaptive morphological processing is designed to extract the gradient magnitude and direction. Secondly, this extracted information is weighted fused with the gradient magnitude and direction obtained from the traditional Canny operator. Subsequently, an adaptive dual threshold algorithm is devised for edge detection and connection. Finally, the proposed algorithm is experimentally validated using images collected from industrial robot assembly lines. The results demonstrate that the proposed algorithm outperforms traditional methods, detecting more effective and continuous edges with significant noise reduction.

Keywords: Morphology; Canny Operator; Workpiece Edge Detection; Adaptive; Fusion Algorithm

1. Introduction

With the rapid advancement of "Made in China 2025", replacing manual labor with robots in industrial manufacturing has become an inevitable trend, and the application of machine vision in industrial robot target recognition is becoming more and more widespread [1]. In order to improve the accuracy of edge detection, literature [2-4] combined mathematical morphology with wavelet transform algorithm, adaptive median filtering, and bilateral filtering, and literature [5-7] used Canny operator combined with geometric features, guided filtering, and two-dimensional Cauchy distribution algorithms, which improved the accuracy of defect detection, but the effect of removing the noise from the images in the complex industrial environment is not good. Literature [8-9] proposed deep learning methods, edge extraction effect accuracy is greatly improved, but the neural network training time is too long, and the hardware requirements are high, which greatly increases the cost.

Aiming at the above problems, this paper proposes a fusion algorithm based on weighted adaptive mathematical morphology and adaptive dual threshold for Canny operator edge detection. Experimental results show that the algorithm in this paper improves the edge clarity of the workpiece target, maintains the continuity of the image edges, has better image denoising effect, better adaptive ability, and is more suitable to be applied to the adaptive edge detection of video images.

2. Improved Mathematical Morphological Edge Detection Operator

2.1 Traditional mathematical morphological edge detection operator

The traditional mathematical morphology edge detection operators have four mathematical morphology operations, Erosion, Dilation, Opening and Closing. Let the original image pixel point be $O(x,y)$ and the structural element of morphological operation be $S(x',y')$. Then each pixel point after the operation is $T_C(x,y)$, $T_E(x,y)$, $T_{Open}(x,y)$ and $T_{Close}(x,y)$ respectively.

$$\begin{cases} T_C(x,y) = \min\limits_{x',y' \in S} \{O(x+x', y+y')\} \\ T_E(x,y) = \max\limits_{x',y' \in S} \{O(x+x', y+y')\} \\ T_{Open}(x,y) = T_E(T_C(x,y)) \\ T_{Close}(x,y) = T_C(T_E(x,y)) \end{cases} \quad (1)$$

2.2 Weighted adaptive morphology approach

In order to better remove the influence of discontinuous traces on the surface of the image on edge detection, maintain the continuity of the edges of the artifact and enhance the denoising ability of the image, a weighted adaptive mathematical morphological edge detection method is proposed.

First, we construct the OtC(Opening then Closing) filter. Let the number of times the workpiece image is "OtC" using circular, square, and flat structural elements be N_R, N_S, and N_F, respectively, and the total number of processing $N(N = N_R + N_S + N_F)$ times. The number of processing times is calculated according to the difference between the result of each structural element and the original image, and the smaller the difference is, the more the number of morphological processing times under the structural element will be. Taking the square structural element $s(x', y')$ to "OtC" the image (selecting scale 4) as an example, let f_n be the image function obtained by the nth OTC, i.e.:

First OtC: $f_1 = f\ \Theta \mathrm{g}$ (2)

Second OtC: $f_2 = f_1 \Theta g$ (3)

Until $\{(x', y') | f_n - f_{n-1} = 0\}$, the number of treatments of structural elements at that scale is obtained.

Let W_R, W_S, and W_F denote the weight coefficients of the morphological treatments accounted for by the circular, square, and flat structural elements, respectively, as shown in Equation 4:

$$\begin{cases} W_R = \dfrac{N_R}{N} \\ W_S = \dfrac{N_S}{N} \\ W_F = \dfrac{N_F}{N} \end{cases} \quad (4)$$

Let the image before processing be $f(x, y)$ and the image after morphological processing be $F(x, y)$. The weighted adaptive morphological processing formula is as follows:

$$F_W(x, y) = W_R \times f_R(x, y) + W_S \times f_S(x, y) + W_F \times f_F(x, y) \quad (5)$$

Where, $f_R(x, y)$, $f_S(x, y)$, $f_F(x, y)$ denote the results of one "OtC" morphological processing of the original image with circular, square and flat structural elements, respectively.

3. Improved Canny operator

3.1 Traditional Canny operator

Canny edge detection operator is by far one of the most widely used and classical edge detection algorithms. It includes four basic steps: Gaussian filtering, calculating gradient magnitude and direction, non-extremely large value suppression of gradient magnitude, and dual threshold algorithm to detect and connect edges.

3.2 Adaptive Dual Threshold Algorithm

The traditional Canny algorithm adopts the method of double threshold to discriminate the edge information, the size of the high and low threshold need to be manually selected and set, and need to rely on the a priori experience and repeated trials to determine the algorithm is poorly adaptive, in order to solve these problems, this paper proposes an adaptive double threshold algorithm based on OTSU, automatic determination of threshold using maximum interclass variance.

For an M×N image, the segmentation threshold of foreground and background is denoted as T. The number of pixels in the image whose gray value is less than the threshold is N_p, and the ratio of the number of pixel points in the foreground to the whole image is denoted as p_p, and its average gray scale is AG_p; the number of pixels in the image whose gray value is greater than the threshold is N_b, and the ratio of the number of pixel points in the background to the whole image is p_b, and its average gray scale is AG_b. The total mean gray

level of the image is denoted as AG and the inter-class variance is denoted as v,then there are:

$$\begin{cases} p_p = \dfrac{N_p}{M \times N} \\ p_b = \dfrac{N_b}{M \times N} \end{cases} (6)$$

$$N_p + N_b = M \times N (7)$$

$$P_p + P_b = 1 (8)$$

$$AG = AG_p \times P_p + AG_b \times P_b (9)$$

$$v = P_p \times (AG - AG_P)^2 + P_b \times (AG - AG_b)^2 (10)$$

Jointly calculating equations (9) and (10), we get:

$$v = P_p \times P_b \times (AG_P - AG_b)^2 (11)$$

Then use the traversal method to find the threshold T when v is the maximum, then T is the optimal threshold, so that it is the high threshold T_h in the double threshold, then the low threshold can be denoted as T_l :

$$T_l = T_h \times k (12)$$

Where, is the ratio of low threshold and high threshold, in general the value range is [1/3,1/2], here take 1/2.

4. ACMC(Adaptive algorithm for Combining Morphology and Canny operator)

The flowchart of ACMC proposed in this paper is shown in Fig. 1 and is implemented as follows:

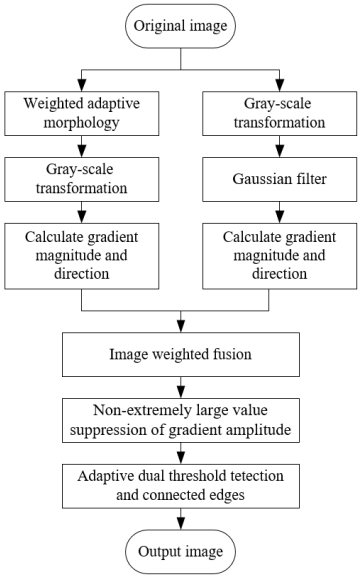
(1) Sub-process 1: The original color image is detected by Improved weighted adaptive morphological approach in 2.2 in HSV color space; then the result is gray-scale transformed, and then its gradient magnitude and direction are calculated to get the gradient image.

(2) Sub-process 2: Gray-scale transform the original color image, and then perform Gaussian filtering, and then calculate its gradient magnitude and direction to get the gradient image.

(3) The results of steps (1) and (2) are subjected to image weighted fusion.

(4) Using the gradient magnitude and angle from step (2), the gradient magnitude is suppressed for the fused image of step (3).

(5) Detect and connect the edges using the adaptive dual threshold algorithm in 3.2 to obtain the final fused image.



[Fig. 1] Flowchart of ACMC algorithm

5. Experimental results and analysis

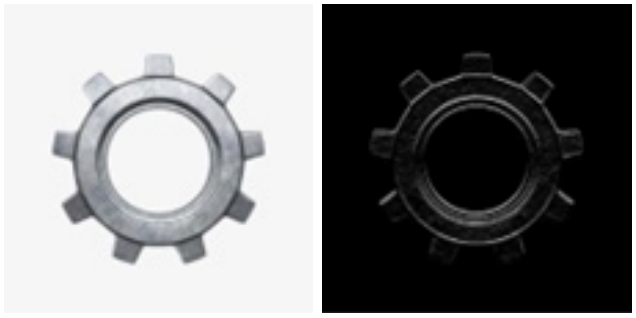
In this paper, the image edge detection algorithm, two evaluation metrics are implemented on MATLAB R2018a version.

5.1 Experimental effects and subjective evaluation

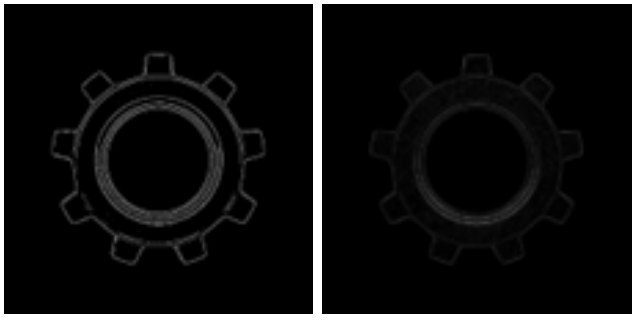
In order to test the feasibility and effectiveness of the proposed algorithm, workpiece images captured by an industrial camera are used for experimental comparison and verification.

(1) Comparison of the effect of edge detection algorithms for noisy images

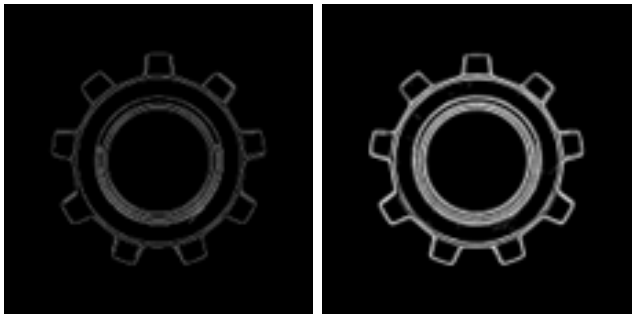
Sobel operator, Roberts operator, Laplace operator, Canny operator and the algorithm of this paper are used to detect the edges of the original image of the "Gear workpiece" respectively, and the results are shown in Fig. 2(b)~(f). The experimental results show that this paper's algorithm image detail protection is better, the edge extracted contour is more clear and complete.



a)original image b)Sobel



c)Roberts d)Laplace

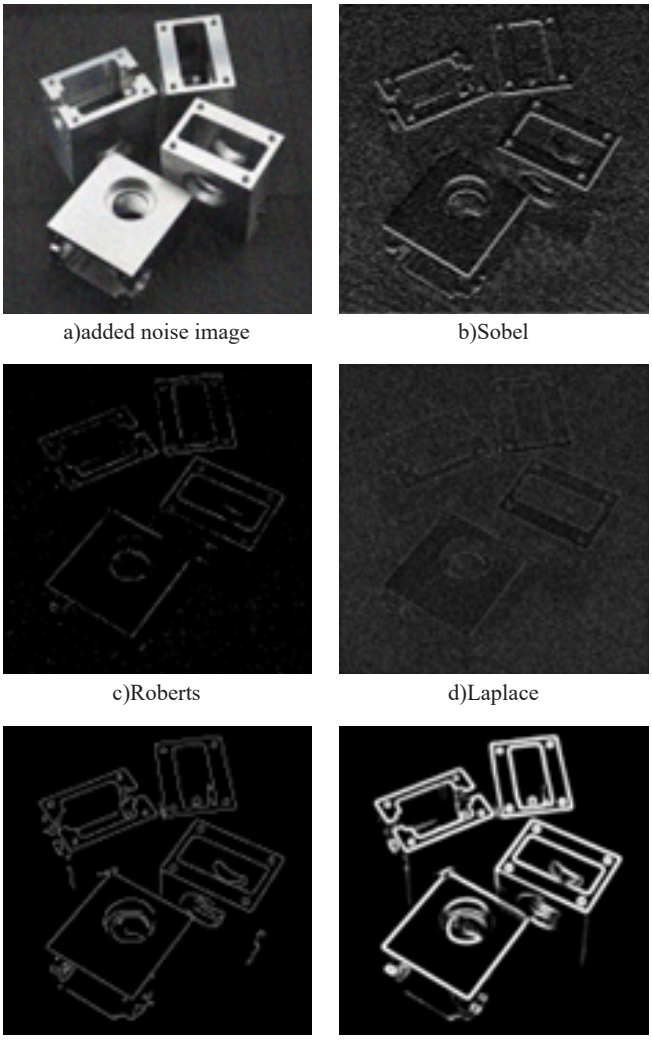


e)Canny f)Our(ACMC)

[Fig. 2] Comparison of image edge detection algorithms without noise

(2) Comparison of the effect of image edge detection algorithms with Gaussian noise added

Add Gaussian noise with standard deviation $\sigma = 0.01$ to the original image of "Lathe workpiece", such as Fig. 3 a), and then repeat the processing of (2), the results are shown in Fig. 3 b)~f), the experiments show that the algorithm in this paper is able to detect a clearer and more complete edge of the target than other algorithms, and has stronger noise immunity, and has better processing effect on complex background.



a)added noise image b)Sobel

c)Roberts d)Laplace

e)Canny f)Our(ACMC)

[Fig. 3] Comparison of image edge detection algorithms with added noise

5.2 Objective evaluation of experimental effects

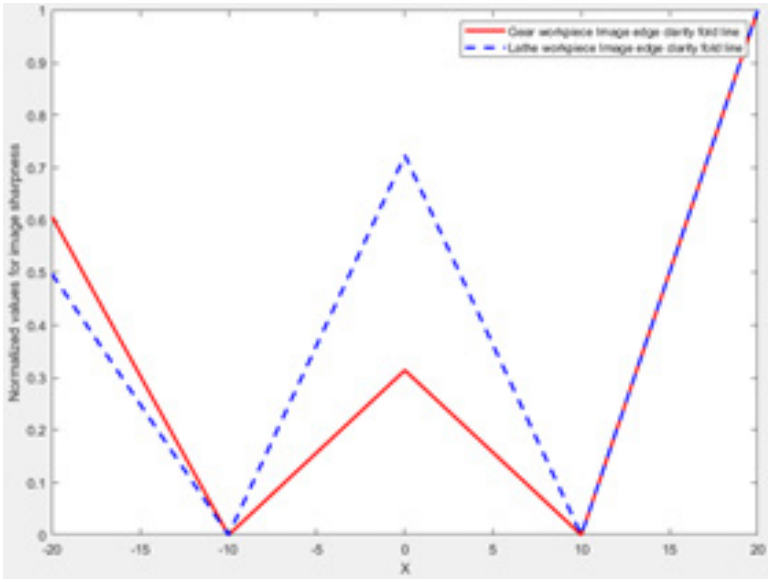
(1) Image edge sharpness evaluation based on image gradient

The clearer the image, the more drastic the change of gray value of pixels at the edge, and the gradient value will be larger. In this paper, the energy gradient function EOG (Energy of Gradient) is used as the image clarity evaluation index: the sum of the squares of the difference between the gray values of the neighboring pixels in the x direction and the y direction is used as the gradient value of each pixel, and the gradient values of all the pixels are added up as the value of the clarity evaluation function, as shown in equation (13).

$$D_f = \sum_x \sum_y \left\{ \left[f(x+1, y) - f(x, y) \right]^2 + \left[f(x, y+1) - f(x, y) \right]^2 \right\} \quad (13)$$

In Fig. 4, the red line is the result of comparing the effect of the edge detection algorithm without noise image. The images detected at points (-20, 0), (-10, 0), (0, 0), (10, 0), (20, 0) are Fig. 3 a), b), c), d) and the algorithm in this paper, respectively. The closer the normalized line graph is to 1, the clearer the image is. From the line graph, it can be seen that the edge of the image after edge detection of this paper's algorithm is the clearest.

In Fig. 4, the blue line is the result of comparing the effect of edge detection algorithms for noisy images. The images detected at points (-20, 0), (-10, 0), (0, 0), (10, 0), (20, 0) are Fig. 4 b), c), d), e) and this paper's algorithm respectively. As can be seen from the normalized line graph, the image edges after edge detection of this paper's algorithm are the clearest and the denoising effect is the best.



[Fig. 4] Image clarity indicators

(2) Image denoising effect evaluation index PSNR

PSNR (Peak Signal-to-Noise Ratio) is the most widely used objective evaluation index for images, the method is to calculate the similarity between the denoised image and the original image, and the larger the value indicates the smaller the image distortion.

The comparison of PSNR values of images without added noise is shown in Table 1 and the comparison of PSNR values of images with added noise is shown in Table 2. From the data in Table 1 and Table 2, it can be seen that the PSNR values of this paper's algorithm are maximized when the target image is processed, indicating that the proposed algorithm in this paper effectively removes the noise and also ensures the image quality well.

<Table 1>Comparison of PSNR values of images without added noise

Image after edge detection	PSNR
Sobel [Fig. 2] b)	24.5447
Roberts [Fig. 2] c)	24.4987
Laplace [Fig. 2] d)	24.5086
Canny [Fig. 2] e)	24.5059
Ours [Fig. 2] f)	28.5584

<Table 2>Comparison of PSNR values of added noise images

Image after edge detection	PSNR
Sobel [Fig. 3] b)	27.9154
Roberts [Fig. 3] c)	27.6798
Laplace [Fig. 3] d)	27.8862
Canny [Fig. 3] e)	27.6838
Ours [Fig. 3] f)	32.0303

6. Conclusion

Based on traditional mathematical morphology theory and Canny operator theory, this paper proposes a fusion algorithm for workpiece edge detection based on morphology and Canny operator, establishes a weighted adaptive morphological processing model and an adaptive dual threshold processing model, and weighted fusion of traditional morphology and Canny operator gradient. Experiments show that the edge detection of this paper's algorithm is more effective and continuous, and the removal of noise is effective.

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Research on Mechanical Design, Manufacture and Automation in the Background of Information Technology

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Abstract: Under the perspective of the rapid development of information technology, the field of mechanical design and manufacturing has ushered in unprecedented changes. Traditional design methods and manufacturing processes gradually show limitations under the wave of digitalization and intelligence, such as low work efficiency, limited design accuracy, high production cost and other problems have become the bottleneck of the development of the industry. In order to solve these problems, this paper focuses on the integrated application of computer aided design (CAD), automatic manufacturing technology and intelligent monitoring system, aiming to improve the design accuracy, optimize the manufacturing process, reduce costs, so as to promote the development of mechanical design and manufacturing industry to a more efficient and accurate direction.

Keywords: Information Technology; Mechanical Design and Manufacturing; Automation

Introduction

Mechanical design and manufacturing is an art and science that involves the transformation of various materials into mechanical equipment and components. It includes the whole process from the initial conceptual design to the final product manufacturing, covering material selection, design principles, manufacturing technology, quality control and so on. In the design stage, engineers use advanced tools, such as computer-aided design (CAD), to create and test models of mechanical components, which are transformed into actual mechanical components through various manufacturing techniques, such as casting, welding, machining, etc. Quality control ensures that these components meet strict standards and performance requirements. With the rapid development of information technology, this field is experiencing a revolution driven by digitalization, automation and intelligence, constantly promoting the mechanical design and manufacturing process to a more efficient direction.

1. Application of information technology in mechanical design and manufacturing

1.1 Progress in computer-aided design (CAD)

Progress in computer-aided design (CAD) has brought about fundamental changes to the field of mechanical design. The CAD system enables designers to create detailed engineering drawings and 3 D models in a digital environment, greatly improving the accuracy and efficiency of the design. The application of this technology is not limited to the first draft of the design stage, but also extends to the entire life cycle of the design, including modification, analysis, and optimization[1]. Advanced tools embedded in CAD systems, such as finite element analysis (FEA) and computational fluid mechanics (CFD) simulation, allow engineers to evaluate the overall performance of the design before actual manufacturing. This assessment can predict the material stress, heat flow distribution, and other key performance indicators, thus reducing the need for practical testing and shortening the product development cycle.

With the progress of CAD technology, its application in mechanical design has become more common and diversified. The integration of cloud computing and artificial intelligence makes CAD systems more intelligent and user-friendly. For example, through the cloud infrastructure, multiple designers can simultaneously collaborate on a complex mechanical design project, enabling data sharing and real-time update, greatly improving the efficiency of teamwork. The application of artificial intelligence can help designers automatically perform repetitive tasks, such as automated sketching and design optimization recommendations, thus allowing designers to focus more on innovation and solving complex problems.

1.2 Three-dimensional modeling and simulation technology

3 D modeling and simulation technology have brought profound influence on the field of mechanical design. Three-dimensional modeling technology enables designers to build accurate models of mechanical components and systems in a virtual environment that not only demonstrate the geometry of an object, but also reflect its material, quality, and working principle. In this way, the designer is able to view and test the design in detail before actual manufacturing, ensuring compliance with technical specifications and functional requirements[2]. In addition, 3 D modeling provides unprecedented flexibility and accuracy for the design of complex mechanical systems, which can easily modify the design and view the effects of changes in real time, greatly reducing the possibility of design errors and rework. With the continuous progress of modeling technology, modern 3 D modeling software not only supports static design, but also can simulate dynamic behavior and practical operating environment, providing a more comprehensive and detailed design assessment.

Closely related to the 3 D modeling technology is the simulation technology. Simulation technology allows engineers to test and validate designs in virtual environments that can simulate actual working environments in a variety of physical, chemical, or biological conditions. For example, simulations can evaluate the performance of mechanical components under extreme temperature, pressure, load, or vibration conditions, thus ensuring the reliability and safety of the design. This method not only saves a lot of physical testing costs, but also greatly shortens the product development cycle. More importantly, the simulation technology enables designers to identify and solve potential design problems at an early stage, reducing the cost and risk of later modifications[3].

1.3 The role of information technology in design optimization

Information technology plays a crucial role in mechanical design optimization, which not only improves the efficiency of the design process, but also significantly improves the performance and reliability of the final product. In the design stage, by utilizing advanced computing methods and algorithms, information technology can assist engineers in the detailed analysis and evaluation of the design scheme, so as to ensure the optimization of the design. For example, by using optimization algorithms, such as genetic algorithms or simulated annealing methods, optimal combinations can be found among numerous design variables, minimizing the maximum efficiency and cost of material use. In this process, information technology not only speeds up computing, but also provides a broader space to explore design solutions, allowing engineers to consider more possibilities to discover more innovative and efficient design solutions[4].

Information technology also plays a key role in continuously monitoring and improving existing designs. Through integrated sensors and real-time data analysis, the operation of the mechanical system can be continuously monitored to find potential problems and performance degradation in time. These data can not only be used for timely maintenance and repair, but can also be fed back into the design process to provide valuable data support for future design improvements. For example, by analyzing the wear patterns and failure causes of mechanical components, the design can be slightly adjusted to improve durability and reliability. In this process, information technology is not only a tool for data processing, but also a bridge connecting the actual operation and design optimization, to ensure the continuous progress of design and meet the changing application needs and technical challenges.

2. The role of information technology in the automation of mechanical design and manufacturing

2.1 Computer Integrated Manufacturing (CIM) system

The CIM system automates and realizes the manufacturing process by integrating different stages of design, manufacturing, quality control and supply chain management. This integration not only improves production efficiency, but also substantially reduces cost and error rates. Core technologies in CIM systems include advanced computer-aided design (CAD) and computer-aided manufacturing (CAM), a combination of which allows the seamless process from design to manufacturing, reducing the need for human intervention. For example, designs completed by designers in CAD software can be then directly imported into CAM software and automatically converted into manufacturing instructions, which greatly reduces the time from design to production. In addition, the CIM system includes advanced Material

Requirements planning (MRP) and production planning scheduling systems, which automatically adjust production plans and material supply according to real-time data to ensure efficient and continuous continuity of the production process.

The flexibility and scalability of CIM systems is particularly important in highly competitive modern manufacturing environments. By using a modular design and open architecture, CIM systems can easily adapt to different production requirements and changing technological environments. For example, manufacturing companies can add new functional modules, such as 3 D printing or robot automation, as needed, to adapt to new manufacturing technologies and market needs[5]. In addition, data analysis and AI algorithms in CIM systems are able to extract valuable insights from mass production data, which can help manufacturers optimize production processes and improve product quality. For example, by analyzing the data in the production process, you can identify inefficient links or potential quality problems, and then adjust the production parameters or process flow to solve them. This continuous improvement and optimization is the key to the competitiveness of the modern manufacturing industry, and the CIM system is just a powerful tool to achieve this goal.

2.2 Automated assembly and robotics technology

Automated assembly techniques utilize custom robotic arms and other automated devices to perform repetitive assembly tasks, thereby reducing reliance on labor. The application of these technologies is not limited to simple repetitive tasks, but also extends to more complex operations, such as the installation of precision parts and the welding of electronic components. Automated assembly systems often integrate advanced vision and sensing technologies that ensure precise placement and rapid adjustment of components[6]. For example, by using high-precision cameras and pressure sensors, automated systems are able to monitor the assembly process in real time and automatically adjust to ensure assembly quality.

The development of robotics has brought new dimensions to automated assembly. Compared with traditional automated systems, robots have higher flexibility and adaptability, and can perform more complex and variable tasks. Modern industrial robots are often equipped with advanced control systems and artificial intelligence algorithms that enable them to learn autonomously and adapt to different operating environments. This allows robots not to only work on highly standardized production lines, but also to meet the needs of small batch and customized production. In addition, robotics also plays an important role in improving production safety. When performing dangerous or harmful tasks, robots can replace humans, thus reducing the risk of work-related accidents. For example, robots can be used to operate in high temperature, high pressure or toxic environments to keep people safe.

Tag

With the continuous progress of information technology, the field of mechanical design and manufacturing has ushered in unprecedented development opportunities. From computer-aided design to automated assembly to intelligent manufacturing processes, the integration of these technologies not only optimizes the design process, but also greatly improves production efficiency and product quality.

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From Mechanistic Philosophy to General Organology—Materialistic Dialectics of Machinery and Organs

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Abstract: The French philosopher Bernard Stiegler's philosophy of technology is wide spread all over China, while the researchers do not pay the same amount of passion in critical analysis and uncritical applications. Few articles have been issued on the topic of the originality of general organology. Through problematic analysis and research of thought of history, the academic significance and contemporary value of general organology has been revealed, which is a synthesis of the study of the history of the body and the history of technology that helps to scientifically understand the technical reality and psychological reality in contemporary eras.

Keywords: Mechanism; Megamachine; Organ Projection Theory; General Organology

1. Introduction

Bernard Stiegler is a representative figure of in the field of philosophy technology, whose "technics and time" three volumes has caused great repercussions. However, general organology (l'organologie gérale in French), as one of his main doctrines, does not get the attention it deserves. In order to make it understand by potential readers in need, this paper will return to the essence of the problem in terms of the history of ideas and technology: what are the internal reasons for comparing organs to machines and machines to organs, and what are their external effects?

2. Mechanical materialism: the machine metaphor from organ to society

2.1 Mechanical metaphors of organs

The mechanical metaphor of the organ is indiscriminately based on Descartes' mind-body dualism: matter is reduced to res extensa, while life is abstracted to res cogitans, and the nature of the entity that is relevant to the extensa is called the first nature, while the nature that can only be thought of by the life is called the second nature, and the primacy of the first over the second defines a "mathematized" new physics, and the Aristotelian physics explanation of the purposive and dynamical causes of motion was replaced by the new physics explanation of dynamics, the metaphysics of the new physics introduced a mechanistic philosophical view of the world: that nature is the most subtle of clocks and watches, and that God is the most brilliant of watchmakers. From the point of historical view of materialism, this mechanistic metaphor of logical chain entered into cultural life with the technological development of 17th century.

In addition to the influence of technology, the achievements of the physiological sciences contributed to the formation of a mechanistic worldview: with the public publication of William Harvey's Theory of the Motion of the Heart and Blood, the Galenic doctrine, which had ruled the medical profession for millennia, was overthrown and the circulatory theory of the body's blood took its place, even though Harvey himself continued to take a cautiously vitalist view: "(For Harvey), organs are more like 'autonomous' creatures than clocks or mechanical pumps "[1], yet there was no shortage of Cartesian interpreters of Davy's findings, and in the case of the Italian physician Giorgio Baglivi (1668-1706), the human body was thoroughly sophisticated machine, and the organs were inter-coordinated machine parts:

> "Examine with some attention the physical economy of man: What do you find? The jaws armed with teeth: Are they anything but pliers? The stomach is but a retort; the veins, the arteries, the entire system of blood vessels are hydraulic tubes; the heart is a spring; the viscera are but filters, screens; the lungs are but bellows. And what are the muscles, if not cords? What is the ocular angle, if it is not a pulley?"[2]

2.2 The Machine Metaphor of Society

In The Myth of the Machine, historian Lewis Mumford introduced the concept of the "mega-machine" to refer to the "invisible machine" that organizes all the material activities of human society:

Because the components of the machine, even when it functioned as a completely integrated whole, were necessarily separate in space, I shall for certain purposes call it the 'invisible machine'.....But when all the components, political and economic, military, bureaucratic and royal, must be included, I shall usually refer to the 'megamachine': in plain words, the Big Machine. [3]

In his opinion, the best example of the ancient giant machine is the pyramid in ancient Egypt. In ancient times, the megamachine aimed at the mobilizing power of manpower;while in modern times, the megamachine aims at saving the cost of manpower. Despite their diametrically opposed attitudes toward manpower, both operate on the same logic, namely, the efficient functioning of the megamachine itself. In Mumford's view, Hitler was the main enforcer of the modern megamachine, and Hitler's totalitarian model was so tightly integrated with the most advanced science and technology of the time that Albert Speer, the Minister of Armaments in Hitler's regime, still insisted at his trial before the International Court of Justice at Nuremberg that:

"Earlier dictators needed highly qualified assistants, even at the lowest level—men who could think and act independently. The totalitarian system in the period of modern technical development can dispense with such men . . . it is possible to mechanize the lower leadership. "[4]

The modern "megamachine" represented by the German Third Reich embodied the ultimate pursuit of efficiency, and although the Third Reich still objectively contributed to the development of productive forces, the production-only mode of social functioning confirmed the limitations of the mechanical materialist understanding of productive forces and relations of production.

3. Organic idealism: from mechanical to social organ projection

The reflection on subjectivity and organicity in German classical philosophy inspired Ernst Kapp to think about technology and society, and Kapp's organ projection in Outline of the Philosophy of Technology laid down his pioneering position in the field of philosophy of technology. Kapp's originality lies in the fact that he explained the nature and power of technology for the first time through the organ projection of the human body, and regarded technological invention as the essence of human being's subjectivity.

3.1 Projection of organs in machines

According to Kapp, machinery is a projection of the human organism in form, structure and function[5] : for simple machinery, the projection is derived from similarities in form, e.g. the hammer is the projection of the hand, the saw is the projection of the teeth; for more complex machinery, the projection is derived from structural similarities, e.g. the steam engine is the projection of the nutrient system; for more complex technological systems, the projections derive from a functional similarity, for example, the railroad system was seen by him as a projection of the blood of the human body, since both have the function of circulation.

Organ projection is not a simple imitation of human organs, according to the textual interpretation of relevant scholars, this projection process is theoretically divided into three steps[6]: one is the unconscious projection, people unconsciously amplify the function of the official, manufacturing mechanical objects to extend the human body's perceptions and the body; the second is the projection of the manifestation of the process, people begin to realize that the mechanical object is a projection of their own organs, "the external world is the internal world"; the third is the projection back, man through the external world of the projection of the material conditions provided by the artifacts, mediated by technology to return to the human body. "The external world is a projection of the internal world"; and thirdly, projection back, in which man returns to himself through the material conditions provided by the artifacts of the external world's projection, mediated by technology, in order to better "know thyself".

3.2 Projection of organs in society

In Kapp's view, not only mechanical objects can be organically projected, but even the state can be regarded as products of organ projection, which might be juxtaposed as the organ projection of society.

In the lever of state, the division of labor in society corresponds to the functions of the organism's organs, such as the nutritional function of agriculture, the respiratory function of commerce, the neurological function of education, and so on. Although we can continue Kapp's analogy, for example, policing for the immune function, religion for the endocrine function, etc., such an argument is far from sufficient to illustrate the essence of the problem - how to prove the universal validity of this analogy? cleverly avoids the differences between the ancient and the modern, and with the aid of the naturalist Haeckel's theory of ontogenesis, he reduces the complexity of human society to the simple natural development of the cell. In other words, organs and human societies are products of cellular differentiation, and in this sense societies can be said to be projections of organs. Although the details of Kapp's and Haeckel's arguments are still somewhat theological, let's call them organic idealism, there is no doubt that Kapp left a place for technology in the field of philosophical anthropology, and perhaps this is the reason why Kapp was discovered by French anthropologists. So far this paper has dealt with the thesis and anti-thesis of the mechanistic-organic dialectic.

4. Organic materialism: from the mechanical to the social impact of the environment

Organic materialism, rather than technical evolutionary theory. In this paper, the term "organic materialism" is used in an awkward way, mainly to indicate the difference between the anti-thesis and the synthesis, and secondly to distinguish it from the Darwinian evolution theory of species, which refers to the technical evolution of organs.

4.1 From technical milieu to associated milieu

Based on paleontological evidence, Leroi-Gourhan argued that "the only undeniable criterion for defining human beings biologically is the presence of tools ."[7] From this argument, in his book Gesture and Speech ,Gourhan reconstructs the evolutionary process of human beings on the basis of the biology of posture (a technological tool that acts on the environment) and language (a tool for establishing contact with other species). According to Gourhan, man assimilates the external environment and fixes the posture of the body through the creation and use of technical tools. In this process, technology is like an organ of the human body - technology forms an envelope between mankind and nature, and the function of the envelope is like the selective absorption of the human organ into the external milieu, which is known as the technical milieu.

Simondon expresses similar views several times in different articles, most of which can be placed under the topic of general technology, for example in "Individualization and Invention" he argues[8] for the essential difference between the technician and other social divisions of labor, because the power of the technician is not only social, but also natural ; as an old proverb puts it, the king who is high in the heavens , too, has to bow down before the barber. The technician is synonymous with the "technological group" in the anthropology of Gourhan, where human groups are subdivided into racial groups and technological groups according to the level of technology, defined respectively as "racial groups are the material manifestation of the internal environment" and "groups that transcend the internal environment".[9]

In Simondon's view, the technician's transformation of the internal environment (social, cultural) of the ethnic group makes a society dynamic, which is what Bergson calls an open society, or in other words, technological evolution and biological evolution are synergistic, although they are not always synchronized.

Simondon argues that technicians in modern society do not refer in general to all those with technical expertise, but in a narrower sense to researchers with research capacity, who connect technological objects with human society, which allows them to tend to maintain a more conscious self-consciousness: for a technological object, it is constrained not only by the natural environment, but also by its own technological environment, and the joint effect of the two is to conjunctive environment; by the same token, for a human being, he is constrained not only by his cultural milieu, but also by technical milieu, and even by his natural milieu. Unfortunately, for most of the rest of the population, this kind of self-awareness is very rare, hence Simondon's appeal to the technician as a representative of the technical object to produce a technical culture, a process which, in turn, is long and difficult, and which can only be accomplished by means of the human resources produced by an encyclopedic technical education.

4.2 From general technology to general organology

Dr. Mingkuan Chen argues that Stiegler reconciles the interrelationships of the three individualizations in Simondon's philosophy of individuation, thus refining the connotation of general technology , "Stiegler's generalized organics is a refinement of Simondon's mechanology, a refinement whose main manifestation is to increase the constitutive significance of technology for the psychological and collective individual, i.e., admit technology individualization, and to rank this individualization as the leading position in the process of mutual individualization, recognizing its leading impetus for the evolution of human society."[10] Stepping back, whether or not one recognizes this as a refinement, the fundamental difference between Simondon and Stiegleris already at stake here: the reason for Simondon's insistence on the distinction between technical individualization and the individualization of living beings is that he believes that the fundamental difference between the evolution of technology and the evolution of living beings lies in the fact that the fundamental difference between the evolution of technology and the evolution of living beings lies in the fact that he believes that the evolution of technology is a fundamental one. The reason for this is that he believes that the fundamental driving force of technical evolution still lies in human invention, and that a machine without human beings is incapable of self-regulation; whereas Stiegler believes that technological individualization not only belongs to the individualization of living beings, but even plays an even greater role.

Perhaps the reason for this fundamental difference is that they lived in different times - Simondon died in 1989, before the Internet appeared, while Stiegler died in 2020, who has witnessed the development of the Internet. Simondon's regret is that he never saw the big language models of AI such as Chat GPT4.0, or in other words, if he had been able to travel to this time, would he have been able to stick to his previous assertions? Can machine learning of artificial intelligence be considered the self-regulation of machines? In the author's view, machine learning is still a form of training, and thus Simondon's distinction between training and learning is still not outdated:

"Machine adaptability is acquired by training, which is heavily dependent on a stable environment and regulates its actions according to defined goals, and is therefore limited by the environment; whereas human adaptability is acquired by learning, which integrates past experience and thus develops the richness of the human symbolic system. ."[11]

Therefore, human beings are not only able to adapt to complex environments, but also able to engage in a conversation with the environment and adjust their own goals in the process of adapting to the environment, and this self-creative ability distinguishes the adaptability of human beings from the adaptability of machines. In this sense, Simondon's general technology and Stigler's general organics are mutual refinements rather than linear advances in thought.

5. Conclusion

Mechanical, electrical and information technologies have shaped different people's imaginations of machinery in different times, while culture has shaped different people's cognitive images of the human body itself; the intertwining of these two mental images constitutes a dialectical movement of machinery and organs, while general organology is a philosophical attempt to grasp the images of the present.

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According to Etymonline, an online etymology dictionary, the English word "chain" appeared in the fourteenth century with the original meaning of "a connection made of metal or other material" and acquired a new meaning around the seventeenth century "anything connected together".

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Rethinking on the Collaborative Development of the New Energy Vehicle Industry Chain and Innovation Chain under the "Dual Carbon" Goal

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Abstract: With the increasing severity of global climate change, achieving carbon peak and carbon neutrality has become a shared responsibility of the international community. As an important way to reduce greenhouse gas emissions and promote energy structure transformation, the coordinated development of the industrial chain and innovation chain of new energy vehicles has become the key to achieving the "dual carbon" goal. This article aims to explore how to promote the effective integration and coordinated development of the new energy vehicle industry chain and innovation chain through policy guidance, technological innovation, and market mechanism optimization under the guidance of the "dual carbon" goal, in order to provide strategic support for achieving the dual goals of sustainable economic development and environmental protection.

Keywords: Dual Carbon; New Energy Vehicles; Industry Chain; Innovation Chain; Collaborative Development

1. Introduction

The "dual carbon" goals, namely "carbon peak" and "carbon neutrality", are two major national strategic goals proposed by the Chinese government to address global climate change. Among them, "carbon peak" refers to the situation where China's carbon emissions will not rise again after reaching their peak by 2030; "Carbon neutrality" refers to achieving a balance between economic and social development and total carbon emissions by 2060. This strategic background is aimed at promoting green and low-carbon transformation, promoting sustainable development, and reducing greenhouse gas emissions on a global scale.

Under the "dual carbon" target, new energy vehicles are developing rapidly. The government has introduced a series of policies to support the development of the new energy vehicle industry, including reducing and exempting purchase taxes, constructing infrastructure such as charging stations, and promoting electrification in the public transportation sector. Major automobile manufacturers have also increased their research and development investment, launching more styles of new energy vehicles to meet market demand. In the future, with the advancement of battery technology and cost reduction, new energy vehicles will become more popular. The new energy vehicle industry has become an important component of the national strategic emerging industry due to its clean and low-carbon characteristics. The development of new energy vehicles not only involves the technological progress of the vehicles themselves, but also relates to the deep integration of the upstream and downstream industrial chain and the continuous promotion of the innovation chain. Therefore, exploring the collaborative development path between the industrial chain and the innovation chain is of great significance for accelerating the maturity and promotion of the new energy vehicle industry.

2. Overview of the New Energy Vehicle Industry Chain and Innovation Chain

2.1 Overview of the New Energy Vehicle Industry Chain

The new energy vehicle industry chain includes upstream raw material supply, midstream component manufacturing and assembly, downstream market sales and services, as well as recycling and utilization. Among them, battery technology, motors, and electronic control systems are the core technologies and value highlands in the industrial chain. The new energy vehicle industry chain covers the entire process of new energy vehicles from design and development, production and sales, to scrapping and recycling, forming a complete industrial ecosystem.

The implementation of the "dual carbon" goal has put forward higher requirements for the new energy vehicle industry chain, includ-

ing improving energy efficiency ratio, reducing emissions, optimizing energy structure, etc. This not only requires all links in the industrial chain to strengthen energy-saving and emission reduction measures, but also promotes the development of the industrial chain towards a more green and sustainable direction.

2.2 Overview of New Energy Vehicle Innovation Chain

The innovation chain of new energy vehicles refers to the entire process from basic research to technological development, to product production and market application. In the new energy vehicle industry, the innovation chain covers multiple aspects such as new material discovery, battery performance improvement, and electric drive optimization. The effective operation of the innovation chain can continuously promote the research and application of new technologies, and is the driving force for the upgrading of the industrial chain. It emphasizes the injection of innovative elements in various links to enhance the comprehensive performance and market competitiveness of new energy vehicles.

The innovation chain of new energy vehicles not only requires cooperation between enterprises, but also policy support, market demand driving, and the participation of scientific research institutions to jointly promote the technological progress and market development of the entire industry.

3. Problems in the Coordinated Development of the New Energy Vehicle Industry Chain and Innovation Chain under the “Dual Carbon” Goal

Insufficient technological innovation

Although China has made certain technological progress in the field of new energy vehicles, there is still a gap compared to the international advanced level. The research and development of core technologies such as battery energy density, safety performance, and charging speed need to be further strengthened.

Incomplete Industry Chain

The new energy vehicle industry chain involves many links, including upstream raw material supply, midstream component manufacturing, downstream vehicle assembly and sales services, etc. At present, the production capacity and technological level of some key links in the industrial chain, such as high-performance batteries, motors, and electronic control systems, still need to be improved.

Infrastructure lag

There is a mismatch between the construction of infrastructure such as charging stations and swapping stations and the rapid growth of new energy vehicles. Especially in third - and fourth tier cities and rural areas, the coverage and service capacity of charging facilities far lag behind demand.

3.4 Policy and market disconnect

When promoting the development of the new energy vehicle industry, the government sometimes overly relies on policy subsidies, leading to some enterprises relying too much on policies and lacking the drive for independent innovation without market-oriented competition. The standard system for new energy vehicles and related facilities has not been fully established, and there is a lack of unified industry and national standards, which affects the interoperability of products and the standardized development of the market.

4. The Path of Coordinated Development between the New Energy Vehicle Industry Chain and Innovation Chain

The coordinated development of the new energy vehicle industry chain and innovation chain faces many challenges, which require the joint efforts of the government, enterprises, and research institutions to promote the healthy development of the industry through various measures and help achieve the “dual carbon” goals.

4.1 Combining policy guidance with market drive

The government guides the development direction of the new energy vehicle industry by formulating relevant policies, providing finan-

cial subsidies, tax incentives, and other measures, while stimulating market vitality, promoting collaborative innovation and resource allocation optimization of upstream and downstream enterprises in the industrial chain.

4.2 Integration and optimization of the industrial chain

The new energy vehicle industry chain includes multiple links such as raw material supply, component manufacturing, vehicle assembly, and sales services. In the context of dual carbon, the industrial chain needs to achieve transformation from low-end to high-end through technological and model innovation, and improve the overall competitiveness and value creation ability of the industrial chain.

4.3 Construction and Strengthening of Innovation Chain

The innovation chain involves stages such as research and development, design, experimental verification, and achievement transformation. The new energy vehicle industry needs to build an innovation system with enterprises as the main body, market orientation, and close integration of industry, academia, research and application, to promote breakthroughs in key technologies and industrial applications.

4.4 Cross border Integration and Collaborative Development

The high complexity of the new energy vehicle industry requires deep integration between different fields, such as cross innovation between automotive manufacturing and information technology, energy technology, and materials science. Through cross-border cooperation, the application of new technologies and exploration of new business models can be accelerated.

4.5 Infrastructure construction and supporting services

The popularization of new energy vehicles requires improved charging facilities and service networks. The government and enterprises should jointly invest in the construction of infrastructure such as charging stations and battery swapping stations, provide convenient charging services, and promote the convenience and user experience of new energy vehicles.

5. Conclusion

Realizing the “dual carbon” goal is a major challenge facing China and even the world, and the development of the new energy vehicle industry is an effective way to address this challenge. Through various means such as policy guidance, technological innovation, and market mechanism optimization, promoting the coordinated development of the new energy vehicle industry chain and innovation chain can not only promote the transformation and upgrading of the industry itself, but also contribute to achieving green development and building an ecological civilization. In the future, the coordinated development of the new energy vehicle industry will place greater emphasis on enhancing sustainability and innovation capabilities, providing solid support for achieving the “dual carbon” goals and high-quality economic development.

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Building Class Culture under the Vision of a Community with a Shared Future Research on the Construction of the “Five in One” Pattern

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Abstract: There is a high degree of compatibility between the community with a shared future for mankind and the community with a shared future for classes. Universities should focus on the fundamental task of cultivating socialist builders and successors, draw on the theory of the community with a shared future for mankind, and use institutional policy culture, environmental interconnection culture, team collaboration culture, competitive technology culture, and think tank culture as supporting elements to construct a “five in one” pattern of class culture construction, fully leveraging the core field characteristics of the class, Committed to achieving the common development of individual college students and class collectives, and improving the quality of education in universities.

Keywords: Community of Shared Destiny Class Culture Construction “Five in One”

1. A community with a shared future for the class

1.1 The proposal of a community with a shared future for mankind

In March 2013, in his speech at the Moscow Institute of International Relations, Xi Jinping, For the first time, the concept of a community with a shared future for mankind has been expounded to the world: “In this world, the degree of interconnection and interdependence among countries has deepened unprecedentedly. Humanity lives in the same global village, in the same time and space where history and reality intersect, and is increasingly becoming a community with a shared future where you have yourself and me have you.” The community with a shared future for mankind inherits the ideal pursuit of “universal harmony” in the excellent traditional Chinese culture, Continuing the brilliance of the Marxist ideology of the “Free Man Union”, as a value system, it contains extremely high political philosophy and rich theoretical connotations;

1.2 The connotation of a community with a shared future for the class

A college class is a whole composed of individuals with common goals and distinct personalities, which is a unity based on respecting differences. The community of shared destiny is the unity of differences and interdependence, and the community of shared destiny in a class has a high degree of compatibility with it. The community with a shared future for mankind not only inspires the world that only through joint consultation and construction can we achieve win-win and shared benefits, but also inspires that in the management of university classes, only by building an effective community with a shared future can we create a moral, mutual aid, and harmonious educational community. The community of shared destiny in a class has three meanings: first, equality and respect among class members in communication and interaction; The second is that members uphold moral ethics and responsibilities towards each other, and enjoy equal benefits and resources in the class; The third is the pursuit of a common vision by members, which is also the cohesion of the class. It can be seen that the class, as an educational organization, institution, and specific community, is a micro unit of ideological and political education in universities. It is not a simple combination of class members, but an educational entity with a common value orientation, moral direction, and spiritual destination.

2. The necessity of constructing class culture in vocational colleges

2.1 Beneficial for the comprehensive development of student quality

Young college students are in the “jointing and booting stage” of their lives, and their bodies, minds, and thoughts are all in the most rapid development period, requiring careful guidance and cultivation. As the only grassroots organization in universities that covers all stu-

dents, classes are not only the basic environment for college students to study and live, but also the identification and basic belonging of college students. Every college student has their own class, and through receiving moral education, intellectual education, physical education, aesthetic education, and labor education, they can achieve self-education, self-management, and self-service. Therefore, whether the class fully utilizes its educational function and whether the class culture construction is good or bad directly affects the achievement of the comprehensive development goal of college students. As the smallest aggregation of ideological and political education in universities, classes should do a good job in class infrastructure construction, stimulate class vitality, based on the actual needs and personalized development of college students, and achieve a downward shift in the focus of ideological and political education in universities, laying a solid first step in truly implementing the fundamental task of cultivating morality and talents in universities.

2.2 Beneficial for showcasing the spiritual style of the class group

Class organizations are the most grassroots organizational units in student work. By carrying out class activities that are popular among college students, they can receive education, develop their abilities, and promote the accumulation of class culture. As a result, class organizations will have a stronger sense of belonging and attraction for college students. Therefore, condensing a class culture that is both distinctive and acceptable to class members will undoubtedly enhance the cohesion, centripetal force, and sense of belonging among class members. By carrying out various colorful class activities, such as basketball matches, football matches, volunteer service activities organized by the class as a unit, there is both division of labor and cooperation, and class members can resonate with the collective honor. Of course, class group activities are not only the process of condensing class culture, but also the process of showcasing class culture, and the two are unified. For example, in recent years, some classes with high academic performance have been referred to as “academic bullies” on the internet, and “positive learning atmosphere and strong learning abilities” have gradually become a symbol of class culture and positive energy. This cultural atmosphere is not only conducive to showcasing the spiritual style of the class, but also conducive to unleashing the educational function of class culture.

3. The “Five in One” Education Path of Class Culture under the Concept of Community with a Shared Future

The community of shared destiny in a class has common ideals, similar values and worldviews, but also differences. Building a community of shared destiny in a class from the perspectives of institutional policy culture, environmental interconnection culture, team collaboration culture, competitive culture, think tank culture, etc. aims to tap into the wisdom contained in class management and create a harmonious, spiritually rich, and sincerely cooperative class community.

3.1 Institutional policy culture is the core guarantee for constructing the “Five in One” pattern of class culture construction

The class community is composed of multiple independent units. At a new development starting point, to promote the unity and unity of each independent unit in ideals, beliefs, emotions, and culture, practical actions must act on the class group and integrate and progress in practice. The core values of shaping a community with a shared future for the class are a long-term systematic project. As a spiritual and cultural category, it is necessary to continuously cultivate a sense of community and unified will, and to subtly cultivate and improve long-term mechanisms, so that the hearts of each unit can converge and their spirits can be interdependent, forming a highly inclusive and cohesive community with a shared future for the class.

3.2 Environmental Internet Culture is an Innovative Fulcrum for Constructing the “Five in One” Pattern of Class Culture Construction

The environment plays a huge role in the moral and psychological development of people. The environment of ideological and political education is formed through subjective regulation and creation, ensuring excellent environmental conditions for the smooth development of ideological and political education, promoting the formation and development of people’s ideological and political character, and playing a

role in infection, influence, and regulation. A beautiful environment shapes a beautiful soul, and the interconnection of the environment, as a material and cultural construction of the class, with its unique educational charm, directly reflects the cultural construction status of the class, provides feedback on the cultural construction threshold of the achievements of teacher and student construction, and plays an indispensable role in the learning and life of students.

3.3 Team collaboration culture is the driving force for constructing the "Five in One" pattern of class culture construction

Marx pointed out that "in the same production process, or in different but interconnected production processes, many people gather together and engage in planned collaborative labor, which is called collaboration." Team collaboration makes reasonable use of the knowledge and skills of each member to work together, enhance the coordination of labor practice, improve resource allocation, solve problems, and achieve common goals, which is incomparable to individual labor. It can be seen that the core of a team is a group of like-minded people who complement each other's functions through reasonable and scientific decision-making.

In the process of building a community with a shared future for the class, the same applies to the class as a team. Only through long-term collaboration can the vision of each student be integrated into a cohesive whole to truly establish a common vision, and enable each member of the class to work together, work together, and unite towards a common goal. Strengthening the awareness of team collaboration goals, creating excellent class groups, improving English proficiency rates, final exam pass rates and other phased goals, with the long-term goal of improving professional knowledge level and stimulating students' subjective learning initiative, generating motivating effects in the process of achieving the goals, thus forming a strong cohesion and driving force for the class's community with a shared future, Create a virtuous cycle atmosphere where everyone learns and the class shines. Innovate learning experience exchange methods, promote one-on-one assistance, and encourage students with good grades to support underperforming students in their studies and daily lives. Hold peer learning experience exchange meetings to deeply explore hot and key issues such as how to learn professional courses well and take postgraduate entrance exams and certification exams.

3.4 Competitive culture is the vitality source for constructing the "Five in One" pattern of class culture construction

Physical beauty and labor

5. University think tank culture is a new energy for constructing a "five in one" pattern of class culture construction

In April 2013, Xi Jinping made important instructions on building a new type of think tank with Chinese characteristics. Over the past decade, relevant departments and universities in various regions have actively formulated policies, provided guarantees, and stimulated momentum to steadily promote the construction of think tanks. Higher education institutions have natural advantages such as a concentration of talent resources, a wide range of disciplines, strong basic research capabilities, and extensive international academic exchanges. The function of think tanks effectively aligns with the school's education, scientific research, and social services. The culture of university think tanks is compatible with both university culture and think tank culture. The values displayed in their development include reflective values, forward-looking education, research-oriented knowledge innovation, and interactive collaboration, highlighting the value system and cultural mission of university think tanks.

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Exploration of Human-Computer Interaction in Computer Game Interface Design

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Abstract: Games play a very important role in people's daily life, and human-computer interaction, as an indispensable element in the interface design of computer games, has been increasingly emphasized. In computer games, the human-computer interaction of interface design has a great influence on the user's experience, operation mode and gameplay. Based on this, this paper discusses human-computer interaction in game interface design from the basic principles of human-computer interaction in computer game interface design.

Keywords: Human-Computer Interactivity; Computer Games; Interface Design

Introduction

In the background of the continuous development of information technology, people's demand for computer games has become higher and higher. The page design of the game has also been gradually developed towards the direction of human-computer interactivity from traditional images, music and other aspects. In the actual game experience process, if the game interface design is not good, human-computer interaction is weak, it will directly affect the user's game experience, reduce the user's interest and playability, and even the phenomenon of user loss. Therefore, in the current computer game interface design, designers pay more and more attention to the human-computer interaction of game interface design.

1. The basic principles of human-computer interaction in computer game interface design

For computer games, the interface design should follow the basic sense of the general principle, that is to say, let the user in the game experience process, enhance the user interest and playability, so as to bring users a better game experience. For example, in the game to inform the user of the current location; how to enter the operation, how to withdraw from the operation and so on. To meet the requirements of human-computer interaction in game interface design, the following principles should be followed.

1.1 Principle of Simplicity

For computer games, not only should it bring users a better gaming experience, but also pay attention to the simplicity of page design, which is also one of the principles of evaluating the quality of games. A good computer game should bring users a good feeling of quick and easy to use at the first time they come into contact with the interface, and improve the user's gaming experience[1] . As computer games for users, if the degree of simplicity is low at the beginning, it is easy to reduce user expectations, resulting in users staying on the page for too long and losing some users. Therefore, in the game page design, the principle of simplicity should be followed to improve the human-computer interaction of the game. Under the guidance of this principle, computer game page design will tend to be more simplified, bringing users a better game experience.

1.2 Principle of consistency

For game interface design, the principle of consistency is to require designers to follow the overall game style in the page design process, to ensure that the page design matches the overall game style and harmonization. This stylistic unity is not simply a superficial unity, requiring a consistent page layout can be, but requires that in the entire game design, page graphics, color, text, music, action, etc. to achieve unity, to achieve a sense of unity in human-computer interaction[2] . Under the premise of the unity of the game interface style, it is also necessary to ensure the rationality of the interface layout, to ensure that the interface contains images, pictures, etc., in line with people's visual imagery, and consistent with people's perception in reality. At the same time, in the game interface, the use of commands should also be uni-

fied from beginning to end to perform running calculations.

1.3 Principle of orientation

In the game interface design, the operation information on the interface should have a clear orientation, guiding the user to see the operation information and then make the corresponding operation. In the actual operation process, users can clearly identify their location at a glance, and can also clearly find the operation information, such as “attack”, “retreat”, etc. At the same time, users should be allowed to jump between related pages at will, to enhance the game interface design. At the same time, users should be allowed to jump between related pages to enhance the interactivity of the game and bring users a better gaming experience.

1.4 Artistic design principles

The design of game interface is the same as other graphic design, need to follow the corresponding principles of graphic design, such as contrast, interest, rhythm, etc., to comply with the picture of the main body and the background of the hierarchy and the order of browsing. Especially for the computer game interface design, the interface contains a lot of dynamic elements, such as the action of the game characters, etc., and the balance of static elements, including the operation of the information buttons, text commentary, etc., the designers need to achieve a reasonable distribution of these elements to achieve balance. At the same time, give full play to the utility of dynamic and static elements, the use of dynamic elements to the user tape its point of entry and exit, and to do in and out of the point of echo, coordination.

In addition, for computer game interface design, to reflect human-computer interaction, it is also necessary to reduce the impact of the game on the computer, to avoid the use of standard interfaces and so on.

2. Human-computer interaction optimization strategy in computer game interface design

2.1 Opening up new input and output methods

From the viewpoint of current game interface design, the most common way of human-computer interaction is the human-computer interaction of multimedia user interface[3] . With the continuous development of information technology, the game interface design has added new elements such as music, animation and so on in the process of development, but the user input method still maintains the traditional way, using the keyboard, touch screen or mouse to input, which means that the input method still maintains a single channel, and has not carried out innovation. Therefore, designers can start from this perspective to open up new input methods in interface design, such as combining voice, gestures, etc., to enhance the human-computer interaction of interface design.

2.2 Toward intelligence and integration

The rapid development of science and technology, promote the development of materials, energy and other industries, new materials, new energy gradually applied to all walks of life, especially the development of microelectronics technology, for the development of computer games to provide more possibilities, so that the pursuit of excellence in the game interface becomes possible. Computer game interface design tends to be more intelligent and integrated, the operation of the game will be more simple and convenient, and the function will be more complete, to ensure that the computer game in the case of page simplicity, the design is more efficient. In addition, in the design process, the modeling will still be towards the direction of light, thin, short and small.

2.3 Highlighting the people-centered concept

In traditional interface design, humanization does not really consider the needs of people, but focuses more on the product itself, taking the use of the product’s function as the focus of the design. However, with the development of human-centered concept, people’s needs have been expanded to the spiritual level, game design needs to pay more attention to the user’s sense of experience, to ensure that the user can safely and comfortably use the product, but also in the product to experience the joy, feel comfortable, to satisfy people’s spiritual needs, the human-centered concept through the game design all the time, to truly achieve humanization.

2.4 Focus on the use of semantics

In game interface design, in order to follow the principles of simplicity and consistency, and to bring users an excellent game experience, we should also pay attention to the use of semantics. The use of semantics can better help users understand the game instructions, prevent ambiguity, and avoid the situation where ambiguity induces users to misuse; follow the principle of simplicity as much as possible, so that users can understand at a glance, and make the next step clear when they see the information. The ultimate goal is that through the use of semantics, self-expression and communication can be put into practice, so that users can better understand the game, better use of the game , and bring users to get a great experience.

In addition, in the prevalence of the concept of environmental protection today, the game interface design should also comply with the development trend, respond to the policy call, the concept of environmental protection throughout the game design, to enhance the game interface human-computer interaction.

Conclusion

It can be seen that human-computer interaction plays an increasingly important role in computer game interface design, which is aimed at providing users with a better sense of experience and interaction. Therefore, in order to improve the human-computer interaction of game interface design, we can start from opening up new input and output methods, tending to intelligentization and integration, highlighting the concept of human-centeredness, and focusing on the use of semantics, etc., so as to realize the human-computer interaction of game interface design, and to bring the users an excellent game experience.

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The Aging Process is "Sneaking" Around Us

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Abstract: "Laoyou App - Internet One-stop Elderly Assistance Platform" is a green channel that plays a role in meeting the diversification and needs of the elderly in their daily lives in the context of China's continuous aging. Make full use of Internet technology to create a more intelligent, convenient and humanized network service platform to provide one-stop and all-round services for the elderly. Create a one-stop service platform for the elderly, coordinate all kinds of scattered pension resources in the society, and realize online and offline dual services, which is unique in today's market. We focus on one-stop service for the elderly, so as to "concentrate on one point and reach the peak", which is more professional and reliable.

Keywords: Aging; Redis In-Memory Database; XML (Extensible Markup Language) Technology Description; UI Layout; SSM Development Framework

With the deepening of China's aging population, topics such as how to "help the elderly adapt to the high-speed Internet era" have become a hot topic. More and more "empty nesters" are emerging, and the quality of life in nursing homes is gradually improving, so it is very important to help the elderly live a quality retirement life.

At present, China's aging has reached a point that cannot be ignored, and it is very meaningful to meet and discuss the social needs and life problems of the elderly, so that the team is more concerned about the construction and achievements in related fields, give full play to the thinking of "Internet + service", coordinate all kinds of pension resources, create a "green channel", and solve all kinds of problems encountered by the elderly in life realistically, and also shoulder relevant social responsibilities, such as the problem of left-behind elderly, medical problems for the elderly, and the cultivation of interests of the elderly. enhance the sense of social participation of the elderly, and so on.

In 2012, the National Office on Aging first put forward the concept of "intelligent elderly care" to encourage and support the practical exploration of smart elderly care[1].Subsequently, in 2015, the State Council issued the "Guiding Opinions on Actively Promoting the "Internet +" Action", which clearly stated that it was necessary to "promote the development of the smart health pension industry"[2]. According to the China Business Intelligence Network, the elderly in China are huge, and the aging of the population has continued to deepen since 2000 after entering an aging society. In 2022, China's population aged 60 and above will be 280 million, accounting for 19.8% of the total population, China's aging trend is obvious, and the demand for pension-related continues to increase, while the size of the pension service market is about 8.2 trillion yuan, and it is expected to reach 10.5 trillion yuan in 2024, and the consumer market is extremely huge[3]. With the continuous promotion and popularization of the concept of "smart pension", the market for elderly products is becoming more and more competitive. The aging of the population, the proportion of the elderly with higher level of education and cognition is also increasing, people are no longer satisfied with the traditional concept of pension, some of the elderly due to the improvement of cultural level and cognitive level, the spiritual demand has also increased, and the consumption potential of products adapted to the pension market is very considerable.

According to the current aging trend, the company has launched an app, mainly for the elderly (aged 60 and above), hoping to improve the quality of life of this group of people through the use of the app to improve the quality of life of this group, extend independent living time and maintain good condition, to dislocate the competition. This group of people is usually not very sensitive to technology, and the product must be designed to be simple and easy to use. According to the use habits of different elderly age groups to carry out personalized customization, and at the same time, for the children, caregivers, volunteers and other people who care about the health of the elderly, through the use of these products to track the health status of the elderly, provide personalized care services, and give them the necessary help, so the product should not only include the use of the elderly themselves but also provide the function of monitoring. At the same time, the dialect module can also increase the user's intimacy and trust in the platform, and the technology is also connected to the AI voice assistant to understand the classification needs of the elderly. Some of the cultural awareness levels of the higher elderly groups are also constantly improving,

and they have also skillfully added custom modules and shortcuts to make these elderly people have a better experience, so as to “lay out the future”. Enterprises will hold relevant interest competitions to cultivate the interests and hobbies of the elderly, solve the problem of loneliness of the left-behind elderly, promote products and increase income generation.

Competitors include not only the same type of products, but also other products that pose a competitive threat, such as housekeeping, health care, community activities, etc. There are also Internet giants such as Google, Microsoft, Amazon, etc.These companies have strong product development teams and technical strength, and can provide a variety of intelligent and connected products for the elderly, such as speech recognition, language translation, etc[4].With strong market competitiveness. These companies focus on the field of medical services, can provide medical health monitoring, care services and other products, have huge medical and nursing service experience and resources, and have rich customer resources. In the research and development of products for the elderly, online traffic can be converted, and traditional medical care and the Internet can be deeply integrated. Their flexibility and agility allow them to iterate quickly and launch new features, with a high upside as the market matures. Therefore, in general, the competition of products for the elderly has entered a comprehensive state, and the means and methods of market competition will also change from a single technology and product competition to a comprehensive competition with multi-dimensional qualities such as platform and resource competition. Enterprises need to firmly grasp market changes, adapt to changes in consumer demand, improve their own technology and product competitiveness, and formulate appropriate market strategies to occupy the market and gain a dominant position.

Compared with Internet giants, the biggest competitive advantage of this app for the elderly is personalized customization. Some unique functions are specially designed for the elderly, such as Beidou satellite positioning at any time, dialect switching, display of nearby hospitals, universities for the elderly, large-value transfer tips and contact emergency contacts, integrated NFC, sick and lost nearby tips, etc. In terms of service, the company will continue to improve the functions of the APP, and actively feedback the opinions of the public for modification. Compared with other all-age service platforms, such as Alipay, WeChat, and administrative apps exclusive to various provinces, the operation is more concise and the interface design is more user-friendly. [5]Other all-age service platforms, they are more focused on young people, the elderly mode is just the user UI has been processed, but the underlying operation logic has not changed, so the relevant operations are still very complicated for most of the elderly, and the old friend app, its operation is more in line with the thinking logic of the elderly, if you encounter unsolvable problems, you can solve it through the “help” mechanism of the old friend app, One-click help for those users with relevant operation records and nearby users to achieve one-to-one service in the fastest way at the lowest cost, and at the same time play a role in product promotion. Compared with other traditional service platforms, it combines online and offline services, such as holding relevant activities for the elderly in each city on a regular basis to meet the spiritual needs of the elderly, which not only solves the problem of “empty nesters”, but also improves the happiness of residents, and also shoulders corporate social responsibility.

In terms of the technology of the old friend app, the backend adopts the mainstream SSM (Spring, SpringMVC, MyBatis) development framework in the market, and uses MySQL as the data storage method. The SSM framework can quickly respond to data requests and implement simple object-oriented programming, and the SSM framework can modularize the code, which is more conducive to the later maintenance of application development[6]. Describe the UI layout through XML technology, and use web front-end development technology to achieve a variety of functions. This technical solution can enable applications to iterate quickly on different platforms and reduce development costs. In terms of data storage, MySQL relational database is used as the data storage mode, and Redis in-memory database is used for caching[7]. This database technology not only enables efficient data storage, but also allows for fast reading and response to requests. Not only that, the technology department also recommends content and services that users are interested in according to data such as user interests and historical behaviors according to algorithm recommendation technology, so as to improve user experience and platform activity. In general, the core competitiveness of the old friend app lies in line with the operation logic of the elderly and the comprehensive function of providing for the elderly, experience first, service-oriented. At the same time, we should also sort out and identify other potential competitors to grasp the changes in the culture and thinking of the elderly in the future. In the future, the cultural level of the elderly will inevitably be higher and higher, and the concept will be more novel, the change of thinking of the elderly, the change of thinking logic will be the key to service and experience, and grasping this is the key to maintaining our competitiveness.

As an emerging market, the product competition pattern has gradually formed, but from the perspective of the products that appear in the current market, there has not yet been an absolute leader. In terms of laws and policies, the government has strengthened the support and supervision of the elderly industry through relevant laws and policies; In terms of fiscal policy, the government supports the development of the elderly industry through fiscal policies, such as tax reductions and exemptions, financial subsidies, support for innovative projects, preferential credit, etc., to encourage more enterprises and scientific research institutions to invest in the elderly industry, and promote the rapid development of the elderly industry; In terms of population policy, the state vigorously promotes the aging policy, encourages more talents to invest in the elderly industry, and establishes a mechanism for socialization and service for the elderly, such as promoting the opening of nursing homes and promoting community pension and family pension. With the support of this series of policies, the elderly industry will have a broader space for development and provide better and more efficient services for the elderly.

With the increasing number of elderly population in China and the increasingly diversified service needs of the elderly, the elderly service industry is also showing a vigorous development trend. The number of people over 60 is expected to increase from 1 billion to 1.4 billion between 2020 and 2030[8]. By 2050, the number of people over 60 will double to 2.1 billion people worldwide. Between 2020 and 2050, the number of people over 80 is expected to triple to 426 million. The elderly service market includes multiple market segments such as life services, health care, social entertainment, etc[9].And the market prospect of the elderly care platform under the Internet model is broad.

Under the general trend of population aging, it is very necessary to help the elderly to better enjoy their old age, but also to reduce their children's worries about the elderly, and to improve the service quality of the domestic pension industry and promote economic growth.

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The Debate on the Spread of 'Literariness' in Chinese Academic Circles

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Abstract: This paper mainly discusses the academic debate on the spread of "literature". In this debate, supporters argue that "literariness" is spreading to other areas, while opponents argue that "literariness" has not really spread. The two sides have the same path in the purpose of maintaining the status of literature, but there are differences on the definition and scope of "literariness". Proponents try to maintain the academic value of literary studies through literary sexual spread, while opponents try to maintain the purity of literature. This paper reviews the Russian formalism literary theory, and analyzes the situation of literature in the image era, in order to judge whether the "literariness" is spreading.

Keywords: Literature; Image; Formalism; Film; Documentary

Foreword

In the context of today's interdisciplinary and interdisciplinary academic research, the application and influence of the concept of "literature" in various fields has attracted wide attention. However, with the advent of the image era, the status of literature has been challenged, and the academic circle began to pay attention to whether literariness is spreading to other fields. This paper aims to sort out the debate on the spread of literary literature, analyze the rationality of all views, and discuss the situation of "literariness" in the image era. This article will introduce the relevant concepts and review the relevant literature in order to provide readers with a comprehensive understanding.

1. The "literary nature" spread theory debate

In 1921, Jacobson, a representative figure of Russian formalism, first put forward the concept of "literature" in his article in Modern Russian Poetry.

Literariness is the scientific object of literature, and even if the work becomes the connotation of a literary work. All kinds of science can also use literary literature as defective second-hand data, but literary science must identify "technique" as the only "protagonist" in its research [1].

As a key concept of literary theory, "literature" has carried the responsibility of acting as the scientific object of literary research since its birth, and has also become a symbol of distinguishing literature from non-literature. The concept of "literariness" is a fundamental concept supporting Jacobson's linguistics and poetics, but it has always been controversial, mainly for its origin and connotation. At present, there is no doubt about the author of the concept of "literary" and the source of literature, but some scholars believe that from the perspective of linguistics, the Russian dictionary of "literary" originally means language standardization, which is a figurative induction of "literary inner law" of Jacobson, rather than a new concept [2]. After tracing the history, some scholars found that the dissemination and construction of the concept of "literature" was not the credit of the Russian formalists, but the product of Russian formalism, new criticism of British and American countries and French structuralism [3]. On the debate of its connotation, the first thing to mention is Jacobson's student Victor Ellich, as a representative of promoting the concept of "literary" to the West, Ellich understood it as "significant feature" or "distinguishing feature" [4], according to this understanding, "literary" is not the essential feature of literature. Another western representative figure is the French critic Twitantodorov. In the beginning of his poetics, he proposed the definition of "literariness": making a literary work have the abstract characteristics of its particularity [5]. Todorov believes that "literariness" is the unique attribute of literature. After the concept of "literature" was introduced into China, different opinions on whether it is the essence of literature triggered the debate on the spread theory of "literariness" among Chinese scholars.

The first shot of the debate was Yu Hong. He started from the end of literature in the End of Literature, and believed that the seeds of

the demise of postmodern literature can be traced back to the end of Hegel's art, replaced by film and television art and science. The rising middle class and the consumer public are addicted to the direct sensory stimulation of Nietzsche's aesthetics and adapt to the film and television art spread by electronic technology. While literature is marginalized in universities and academia, "literature" has quietly penetrated into all kinds of humanities and humanities and social sciences. Then, standing on the basis of the facts of social development, Yu Hong took the consumption of society, media information and public performance as examples to analyze the invasion of "literature". However, the "literariness" in Yu Hong's works is not the "literature" of Jacobson's correct literature, but the deconstructed special literary mode or the overall concept of the collection of multiple literary elements. These literary elements include fiction, metaphor, narrative, imagination, rhetoric and other specific techniques applied to literature. It is these elements that become the grasping point for Yu Hong to prove that other industries have "literary nature". Therefore, Yu Hong's understanding of "literature" should be closer to Erich. As for why the deconstructed "literary" is not replaced by other terms such as "artistic" or "scientific", the author believes that there are two reasons: first, Jacobson, the author of "literary", has no clear concept definition and scope delineation, which triggers different understandings of "literary" in later generations. Second, since the era of printing, the great influence of literature is enough to cover the universal characteristics of all kinds of art, and the elements and techniques of literature are really applied to the process of artistic creation, so that no proper noun is more appropriate than "literariness".

Chen Xiaoming, The disappearance or ghoition of Literature? Writing in 2002, it is similar to Yu Hong's final literary final conclusion and the spread of "literature". After analyzing the internal and external forces of literature, he also discovered the secrets of the fall of literature. The strategy of saving literature is that the future of literature must rely on the power of TV media and non-literature. This forward-looking idea has been verified today, but now the form of film and television media has developed from TV to films, documentaries and short videos. Chen Xiaoming believes that the electronic era has adapted to the human perceptual understanding of the world instinct, so the image easily kills the body of literature, but the soul of literature is not destroyed, and this soul is the "literature" in Yu Hong, specifically refers to the thinking and expression techniques of literature. He believes that the media has been imitating literature, including all the means taken by the media to create "truth" or "fiction", and the production of advertising is a typical representative of them. Literature can be easily combined with language to achieve reproduction without the help of any media, which is impossible to electronic media, and is also the reason why "literature" has always existed. On a broader level, reality is filled by various symbols, including various discourse, various narratives and various allegations, to jointly build the super text of The Times and present it in the form of images and language. Whether we read specific literary works or experience the super text of The Times, the charm of "literary nature" has always been the driving force that attracts us to read, especially the form of "literary nature" narrative. In the age of image, literature did not disappear, but retreated from the front to the background, becoming the core of the image, depicting the dream of "great literature" or "pan-literature" together with the image.

Tao Dongfeng also mentioned the spread of "literature" in the article "The Disenchantment of Literature". He believed that the spread of "literature" is a form of expression of literary disenchantment, which is accompanied by the atrophy of pure literature and pure art and the generalization of aesthetic art. Tao dongfeng understanding of "literary" also tend to rhetoric level, and yu hong view is similar, but the process of literature, art, aesthetics, economic and political aspects in the field of humanities and social sciences, compared with yu hong about literature and literature psychology in specific industry use and practice point of view, dongfeng tao stance wider, wider vision, so the author thinks that: the history of literature, with "cultural" diffusion instead of "literary" diffusion expression perhaps more appropriate. The process of literature is essentially the boundary between literature and the literature gradually blurred process, the result of literature down sacred coat, become cynicism and boring, and after the literature with a strong tendency to literature, the image as the representative of the literary personality, especially in the aspect of literature.

2. The rationality and problem of the "literary nature" spreading theory

Although the spread of "literary" is a local argument, the opinions of Yu Hong and supporters Chen Xiaoming, Tao Dongfeng, Dong Xin and others on the spread of "literary" are more or less influenced by David Simpson and Jonathan Kallal. After Hillis Miller published his view of "the final conclusion of literature", Simpson put forward the view of post-modern "literary rule", that is, the focus of literary

criticism has shifted to other fields. Simpson said: " Literary study itself has become more interdisciplinary than ever (in the form of cultural studies), borrowing new forms of description from sociology, cultural anthropology, political science, psychoanalysis, and so on. Accordingly, non-literary disciplines are gradually being colonized by the redissemination of literary methods by their own extremists [6]."It can be seen that Simpson in fully affirmed the literature for other disciplines discourse yuan narrative function, on the basis of the literature in the integration of postmodern interdisciplinary knowledge system and reconstruction, that literature rule method and effect is based on the construction of interdisciplinary theory, trying to decline in a new subversive way to save literature. Of course, what Simpson calls "literature" refers to the literature in the theoretical form, not only the literary characteristics such as narrative and rhetoric, but also contains the literary configuration as a knowledge generation mode or cultural mode, which is close to the philosophical level [7].

Kallal, on the other hand, builds on Simpson's theory, describing the ruling "literature" as a "literary element". He said: " No matter where the discourse of theories comes from, they always remind us that different variants of literariness play a role in various kinds of discourse, and thus reaffirm the centrality of literature in their way [8]."It can be seen that Kal does not think that literature is gradually dying out, because" literature " is spreading other fields, and post-theoretical literary discourse has become the research paradigm of other disciplines, and has completely changed the research direction of non-literary disciplines. Scholar Xu Zhiqiang believes that the literary paradigm of Simpson and Kler's post-theory not only returns to the ontology of "literature", finds the legitimacy basis of literary existence for literary research troubled by the end of theory, but also provides a post-modern interpretation strategy for knowledge reconstruction of non-literary disciplines [7]. If Simpson and card by discovering the literary theory paradigm in the theoretical era of the inner influence of other humanities, thus again affirmed the status and value of the literature, the rainbow others others deepen their views, the influence of "literary" into all aspects of society, which emphasizes on the basis of "word game" consumer society "literature", involving consumer literature psychology and commodity promotion. Simpson, Kler, Yu Hong and Chen Xiaoming all have the courage to break the boundaries of traditional disciplines and fields. Their innovative views promote the "literary turn" of theoretical research, and also provide the possibility for interdisciplinary and cross-field research. But their views on the spread of "literature" are also being questioned by many scholars.

Wang Yuechuan denied Simpson's view of postmodern "literary rule" directly in his article of "literary character", believing that this is just a misreading of his times. On the contrary, the elite literature and "literary nature" in the postmodern era gradually decayed and drifted away, and the status of literature was compressed by other media methods such as film, television and songs. He believes that the spread of "literature" should not only consider the appropriation of the form of language rhetoric. Although rhetoric has long been not only belonged to literature, the key problem of literature lies more in its spiritual directivity, transcendence and aesthetic modernity [9]. It is also Wu Zilin who sees that the spread of "literary" lacks aesthetic consideration. In his article "Questions on" literary expansion ", he believes that" literary "in the era of commercial consumption is only a means rather than an end, and the poetic beauty of language is the fundamental embodiment of" literary ". The spread of "literature" will only lead to the rupture of the boundary between literature and non-literature, thus leads to the lack of literary ontology research. Moreover, "literature" is originally historical and mobile, and people in different times understand literature and "literature" differently, so there is no spread [10].

Zhang wei in the theory from literature to literature —— consumption era of literary aesthetic disenchantment and value reconstruction article in favor of Wu Zilin about literature and literature boundaries itself is fuzzy and dynamic view, at the same time that the present literature is narrative, rhetoric, metaphor, and a series of text form, so the spread of "literary" is the spread of the form of text, literary elements in other text should be called "reciprocity", if there is a really beyond the literary territory, universal meaning of literature, that is there the corresponding concept of "literary" [11]? Zhang Wei's view actually responds to Zhang Kaiyan's "Is literature really in a crazy expansion"?—— Discuss with Professor Tao Dongfeng, he believes that Tao Dongfeng is only listing the art and symbol of goods, consumption and leisure, which is not equal to the literature; the expansion of aesthetic, art and symbol is not equal to the expansion of "literature". Since ancient times, the "literature" has been weakening, because the whole process of social activities in ancient China is full of ritual poems, while the poetic wisdom of modern society is becoming weaker and weaker. Literary language is part of the composition, not the whole composition of language. The literature and "literature" based on language can only highlight part of the characteristics of language. Therefore, it is not comprehensive to talk about the "literature" of social science only from the perspective of linguistics. Although many spiritual and cultural

styles generally have the characteristics of narrative and statement, not all statements or narratives, or general statements or general narrative actions and their results are literary acts, and all are literary [12].

Throughout the voice of the opponents, they mainly grasp the defects of "literary" definition is not clear, hong supporters did not to "literary" concept, or roughly follow Jacobson about "literary" is the nature of literature fuzzy tone, or from the language form and technique include the elements of "literary", the lack of literary aesthetic level and value level. The confusion of the concept of "literariness" leads to the ultimate controversy about "what literature is" in the academic circle. Whether literature is coming to the end, whether there is a boundary between literature and non-literature, and whether "literariness" is spreading has naturally become the following small questions. Wang Yuechuan, Wu Zilin and others don't approve of "literary" spread, but in the face of other humanities and social industry literary elements increase social reality, they did not give reasonable and withstand scrutiny analysis process, is simply interpreted as formal "intertextuality", "artistic" or "aesthetic" characteristics, but this for "literary" spread and that is too thin.

3. Return to the concept of "literature"

In addition to the above two camps, some scholars put forward their own views on "literary". For example, Shi Zhongyi said in his article on The Definition of "Literary" that the definition of "literary" is closely related to the language environment and cultural background [13]. Zhou Xiaoyi and Shi Zhongyi have similar views. In his article " Literariness, he believes that there is no abstract, eternal and objective literariness, only concrete, historical and practical literariness. In China, literariness is the concentrated embodiment of specific social, historical and cultural relations, the floating energy reference in life practice, and the metonymy of the structure of eastern and Western cultural relations[14]. Of course, some scholars also made new construction on the concept of "literature". For example, Liu Huainan and Yao Wenfang both divided "literary". Liu Huainan believed that "literature" = literary "literary", while Yao Wenfang believed that Russian formalism and French deconstruction respectively hold two different "literary".

The views of neutrals may have reached the core of the controversy of "literary" spread, because both supporters and opponents of "literary" spread have the same goal of maintaining literary status. Supporters get inspiration from French deconstruction, and under the pressure of "the final conclusion of literature", choose a new way to separate the noumenon and soul of literature, break the boundary between literature and non-literature, and advocate the expansion of literature for non-literature, aiming to try to maintain the academic value of literary research through the spread of "literariness". In the face of the invasion of the image age, opponents either do not think that literature has the risk of extinction, or oppose the unlimited expansion of literary research to other fields, take the initiative to clarify the difference between literature and non-literature, resist the annexation of non-literature, try to preserve the final purity of literature and maintain the glory of literature for hundreds of years.

Conclusion

We can't say which of the strategies is better, and neither is the "literary" as Jacobson advocated, but they are facing the same enemy —— images. If there is still a breathing space for literature in the image society era, what will be the advent of the image era for literature, and whether "literature" will exist? To answer this question, it is necessary for us to go back to Jacobson's Russian formalist literary theory, starting from the stage of academic research, and looking for the clues of literature in the internal study of literature, so as to judge whether the "literariness" is spreading.

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Implications of Maslow's Hierarchy of Needs for the Ideological and Political Education of Poor College Students in Colleges and Universities

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Abstract: Maslow's Hierarchy of Needs is a psychological theory proposed by American psychologist Abraham Maslow in the 1950s. The theory believes that human needs can be divided into physiological need, safety need, belongingness and love need, esteem need and self-actualization need. The five needs gradually increase in line with the hierarchy, and only after the lower level needs are satisfied will the higher level needs be pursued. As for the ideological and political education of college students, Maslow's Hierarchy of Needs holds significant implications for guiding colleges and universities to carry out the ideological and political education of poor college students.

Keywords: Hierarchy of Needs; Poor College Students; Ideological and Political Education

In recent years, with the launch of the battle against poverty, poor college students have gradually received great attention. They are in the critical period of their lives, and the basic material poverty will exert adverse influences on their psychology, and even cause psychological poverty. Maslow's Hierarchy of Needs clarifies the five needs, from the basic survival needs to the highest realm of the spiritual needs. Ideological and political workers in colleges and universities need to analyze the needs and provide realistic suggestions for the problem of material and spiritual poverty of poor college students.

1. Basic connotation of Maslow's Hierarchy of Needs

Abraham H. Maslow is a famous social psychologist in the U.S., and called as the father of humanistic psychology. In 1954, Maslow proposed Hierarchy of Needs in Motivation and Personality and divided the needs into physiological need, safety need, social need, esteem need, and self-actualization need.

1.1 Physiological need

Physiological need refers to the most basic needs of people to maintain survival and racial continuity, including the need for food, temperature, water, air, sex, and rest. Maslow held that physiological need is the most basic needs of mankind. It is closely related to human survival, and is the foundation of the need system.

1.2 Safety need

As an instinctive need, safety need is from our own protection needs, including the need for life safety, stability of work and study, money and property, legal system, and safety rules. Failure to satisfy the safety need will lead to a sense of fear or even a sense of crisis.

1.3 Belongingness and love need

Belongingness and love need is an emotional need, such as an individual's desire to be cared for, to be included in a group, or even to play an integral role in the group. This is no longer a physical need, but an individual need that rises to the emotional level.

1.4 Esteem need

Maslow held that esteem need should be divided into self-esteem and esteem, including the self-affirmation of one's dignity and value, and the respect from others and society. Through the affirmation of one's own value by oneself and others, people will be confident and passionate about life, and recognize the significance of his existence.

1.5 Self-actualization need

Self-actualization need gets rid of the most basic material, and pursues spiritual achievements. It is manifested as the desire to realize one's ambitions and value in society. Through relentless efforts, one can exploit his potential, realize his ideals, and gradually become perfect.

From the perspective of human values, the above five needs can be divided into two categories. The first category is the low-level need. From the biological perspective, it is a kind of deficiency need, such as physiological, safety, belongingness and love, and esteem needs. The second category is the high-level need. It is not necessary for human survival, so it is called as growth need, such as self-actualization need. Therefore, from the perspective of the biological value of human survival, we make a division of the five needs. The first four are deficiency needs, and the last self-actualization need is the highest level of growth need.

2. Psychological problems of poor college students

2.1 Excessive self-abasement

Self-abasement refers to the denial of oneself, which means lack of self-confidence. Among the poor college students, the sense of self-abasement comes from their economic conditions. When they interact with their classmates, they tend to avoid unknown areas, or even cover up. They think they are not good enough, or expand their own defects, which will affect their physical and mental health. On the one hand, they have strong self-respect, and try to escape from reality with a false sense of superiority. On the other hand, they become sensitive and suspicious, and care more about others' unintentional actions, or non-harmful words.

2.2 Excessive vanity

It is common that poor college students have the comparing mentality when they interact with others. However, some students over-consume, and even borrow to consume. They buy products beyond their economic conditions. They try to cover up their poverty and win others' respect through irrational consumption. Such vain psychology will cover up the authenticity of their life, and they might lose themselves in the wave of comparison, and suffer from mental pressure and pain.

2.3 Excessive anxiety

Anxiety is caused by psychological pressure. Poor college students tend to face greater pressure than their peers, so they are prone to have anxiety. On the one hand, they are anxious about their families. They are delicate and sensitive, overburdened, and anxious about their families and their parents' health. This will influence their study and life. On the other hand, they are anxious about their study. Because the school and society pay great attention to them, they face greater pressure, and even lose interest in study. They take study as a tool for proving themselves or returning to society.

3. Implications of Maslow's Hierarchy of Needs for the ideological and political education of poor college students

Maslow's Hierarchy of Needs reveals the relationship between human needs and growth, and the application of this theory to the ideological and political education in China holds great significance for ensuring the scientific, rational and effective ideological and political education. Based on Maslow's Hierarchy of Needs, ideological and political education workers should focus on the psychological characteristics of poor students, grasp the law of their growth, and carry out targeted educational work. With social and family education, they should provide all-round support for poor college students, and help them get rid of material and spiritual poverty.

3.1 Help college students get rid of material poverty through deficiency need

Deficiency need refers to the most basic and low-level need for human survival. For poor college students, material poverty is the root cause of spiritual poverty. If they want to get rid of spiritual poverty, they must get rid of material and economic poverty. In recent years, the government has invested more in helping them, such as national grants, and national encouragement scholarships. The government also set students loans with national banks to help these students. Therefore, ideological and political workers should respond to the documents of the Party Central Committee and use Maslow's Hierarchy of Needs to help these students.

Firstly, for poor college students, the most basic physiological need is to ensure their basic living needs. Therefore, when carrying out work, college workers should ensure their basic living needs, such as distributing daily necessities, and clothing. Moreover, they should avoid hurting these students' self-esteem and pay attention to the way of helping.

Secondly, apart from obtaining national scholarships, poor students can also take part-time jobs in colleges to ensure survival safety, and meet their own safety need. Therefore, college workers should ensure that they have a safe environment for studying and working, and offer more work-study positions to meet their needs.

Thirdly, poor college students need care and friendship. However, due to their special psychological problems, they tend to be sensitive and suspicious when interacting with others. Therefore, colleges workers should provide psychological counseling for them on a regular basis, and formulate psychological counseling plans for them. In this way, these students can really get rid of psychological burdens, accept the care of others without any doubt and take the initiative to care for others.

Finally, as for the psychological problems of poor college students, self-abasement is accompanied by a strong sense of self-esteem. They care about others' views, and are eager to be recognized, respected, and trusted by others. Therefore, college workers can organize extracurricular activities to help them become confident. Moreover, they can exploit these students' potential to help them be recognized by the society.

3.2 Help college students get rid of spiritual poverty through growth need

Growth need refers to the highest level of self-actualization need, which is the ultimate goal that people start to pursue after the deficiency need has been satisfied. Such need is no longer for material requirements, but the pursuit of the spiritual world. This is also the highest level of ideological and political education of poor students. Now poor college students still have a long to go to get rid of spiritual poverty. The spiritual level involves the value orientation and ideal beliefs. Lacking correct values and ideal beliefs is a common problem facing poor college students as well as the whole group of young college students. Meanwhile, it is also a problem that ideological and political workers need to solve.

As we can know that "poverty alleviation should be combined with the elevation of will and wisdom". Therefore, college and university workers should help poor students embrace lofty ideals and positive values to help them get rid of spiritual poverty and pursue the highest level of self-actualization need. On the one hand, college educators should pay attention to the students' self-actualization need, guide them to pursue the satisfaction of this need, help them set up their own goals and ideals, make plans for life development, and realize their values. Moreover, college educators should promote the scientific theory of Marxism, guide them to set up the ideal faith of Marxism, and cultivate their spirit of striving for the realization of the great rejuvenation of the Chinese nation. Furthermore, college educators need to inspire to work for the wealth of the country and the revitalization of the nation, and formulate ideals according to their personal situations.

On the other hand, college educators need to guide students to combine their personal ideals with the destiny of the country, and to combine the realization of their self-value with the value of society. Through education and guidance, they can help these students to find their own position in different social relations, strive for better self-value, enhance national cohesion and pride, and make them consciously contribute to the realization of the Chinese dream of the great rejuvenation of the Chinese nation.

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Enhancing Students' Conceptual Understanding of Elemental Compounds through Predict-Observe-Explain (POE) Strategy

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Abstract: Knowledge of elemental compounds is a crucial aspect of the high school chemistry curriculum. However, students frequently encounter challenges when studying elemental compounds, including struggles with understanding chemical concepts, as well as a lack of interest in learning. The aim of this research is to investigate the impact of the predict-observe-explain (POE) strategy on enhancing the conceptual understanding of high school students in relation to elemental compounds. The research employed a pre-test and post-test design with an experimental and a control group. A total of 60 students participated in the study, with the experimental and control groups being randomly assigned. The experimental group received instruction on elemental compounds using the POE strategy, while the control group received instruction using a traditional approach. The intervention period for the experimental group lasted 8 weeks, comprising a total of 12 lessons. Data collection involved a two-tier concept test and semi-structured interviews. The results indicated that students taught using the POE strategy achieved significantly higher scores compared to those taught using the traditional approach; Interviews with students in the experimental group revealed a highly positive attitude towards the POE strategy. Thus, the POE strategy is an effective approach that can be implemented in chemistry courses to enhance students' understanding of elemental compounds concepts.

Keywords: Elemental Compounds; POE Strategy; Conceptual Understanding

Introduction

Chemistry, as a scientific discipline, is rooted in experimentation and focuses on investigating the composition, structure, properties, and laws of changes of substances at the molecular and atomic levels. Elemental compounds are fundamental for students' conceptual construction and the development of core subject abilities, which can be considered a significant theme in high school chemistry curriculum[1] . The content related to elemental compounds not only involves the specific application of concepts like substance classification, ionic reactions, and redox reactions, but also serves as a foundation for the study of the periodic table of elements in later stages. It fully reflects the discipline's requirements for the development of students' higher-order thinking and the integration of thinking, making it a topic of great research value. However, students often spend a significant amount of time studying elemental compounds, lacking understanding and systematic cognition of chemical concepts. This lack of successful experiences diminishes their motivation and interest in learning chemistry[2]. Acquiring abstract chemical concepts cannot be achieved through mere mechanical memorization, while it requires engaging in thinking activities that delve into the material's structure and changes, moving beyond surface understanding.

Constructivist teaching methods enable students to achieve meaningful learning outcomes and enhance their conceptual understanding of scientific ideas[3][4]. The predict-observe-explain (POE) strategy is considered an effective teaching strategy for concept learning in constructivist learning theory[5][6]. At the beginning, predictions are made about an experiment or subject, followed by observations and explanations[7]. The prediction stage allows students to make predictions and provide reasons for their predictions, activating their prior knowledge and prompting them to explore their ideas about a concept[8]. In the observation stage, students have the opportunity to observe the experimental activity and record the observed phenomena or results. In the explanation stage, students are challenged to provide reasonable explanations for their predictions and observations (White & Gunstone, 1992). Several studies have explored the use of the POE strategy in science education and have documented its effectiveness in improving student conceptual understanding and reducing misconceptions based on student cognitive development [9][10][11]. The POE strategy also helps develop students' critical thinking and understanding of chemical concepts (Alfiyanti & Jatmiko, 2020) and enhances students' confidence as they complete learning tasks, actively seek answers, and express their opinions[12][13].

However, there is currently a dearth of research on the application of the POE strategy to enhance students' conceptual understanding of elemental compounds. This study aims to address this research gap by investigating the following research questions:

(1) To what extent does the utilization of the POE strategy in teaching elemental compounds affect students' levels of conceptual understanding?

(2) How does the implementation of the POE strategy influence students' conceptual understanding?

Methods and Procedures

Participants

This study was conducted in a public high school in Shandong Province during the fall semester of 2023-2024. A random selection method was used to choose one experimental group and one control group from two classes in the first grade, both of which were taught by the same chemistry teacher. A total of 30 students were randomly selected for the experimental group, and another 30 students were selected for the control group as study subjects. Furthermore, 12 students from the experimental group were chosen for semi-structured interviews.

Research Design

This study utilized a quasi-experimental design to investigate the effects of different teaching approaches on students' learning outcomes. Prior to the study, students had already covered topics such as substances classification, electrolytes, ionization reactions, and redox reactions, and had completed a midterm exam. Based on the analysis of the midterm exam scores, students with similar levels of achievement in chemistry were selected as the research subjects for both the experimental and control groups. The scores from the midterm exam were used as pre-tests to ensure that the students' learning levels were similiar across both groups. In the experimental group, the teaching content on elemental compounds was delivered using a POE strategy, while the control group received traditional instruction. The intervention period for the experimental group lasted 8 weeks and included a total of 12 lessons, with nine POE activities incorporated. To assess the students' learning outcomes, a test consisting of 30 multiple-choice questions, with a maximum score of 100, was collectively designed. The test employed a two-tiered assessment method, where each multiple-choice question had two parts: the choice of the answer and the reasoning behind the chosen answer.

This study employed the SOLO taxonomy method (Biggs & Collis, 1982), categorizing students' learning outcomes into five levels and assessing their thinking levels. According to Holmes (2005), the multiple-choice questions in the study were evaluated based on the five levels of the SOLO taxonomy criteria[15]. Each question was assigned a score corresponding to its level of cognitive understanding: 'Prestructural' (1 point), 'Unistructural' (2 points), 'Multistructural' (3 points), 'Relational' (4 points), and 'Extended Abstract' (5 points). A higher score indicated a higher level of understanding. Post-tests were conducted after 12 lessons for both groups of students. An independent sample t-test was performed using SPSS (version 26) software.

Design 9 activities based on real-life scenarios and experiments. A few examples of the POE activities are provided in Figure 1.

Interview

In a semi-structured interview, a total of 12 students from experimental group were selected, with 4 students chosen from the top, middle, and bottom of each class. The main objective of the interview was to assess the students' comprehension of elemental compounds and their attitudes towards learning about them. These interviews were conducted after the post-test and each interview session lasted approximately 16 minutes. The interview questions are as follows.

1.How do you perceive the application of the POE strategy in the classroom?

2.How do you resolve cognitive conflicts when your predictions and observations do not align?

3.Do you prefer POE courses or traditional courses?

4.What is your impression of the topic 'reasonable use of iron fertilizer'?

Activity 2: Why can't NaClO be mixed with toilet cleaner (containing HCl)?

P: The mixing of NaClO and toilet cleaner containing HCl should be avoided due to their potential reaction. This reaction can reduce the effectiveness of the components present in the toilet cleaner.

O: NaClO reacts with HCl, resulting in the release of yellow gas.

E: This reaction between NaClO and HCl is classified as an oxidation-reduction reaction, which produces a significant amount of Cl_2.

Activity 5: How can we make rational use of iron fertilizer?

P: Reducing agents can be added to the iron fertilizer solution to convert Fe^{3+} to Fe^{2+}; Iron fertilizer is not suitable for calcareous and alkaline soils, as it may reduce the effectiveness of iron fertilizer.

O: Adding iron powder to deteriorated iron fertilizer causes the solution to change from yellow to light green; Adding NaOH solution dropwise to non-deteriorated iron fertilizer solution produces a white precipitate that quickly turns into gray-green, eventually transforming into reddish-brown precipitate; Adding NaOH solution dropwise to deteriorated iron fertilizer results in the formation of reddish-brown precipitate.

E: Iron powder has reducing properties, converting Fe^{3+} to Fe^{2+}, therefore adding a reducing agent to the iron fertilizer can slow down its deterioration; Adding NaOH forms precipitates of $Fe(OH)_2$ and $Fe(OH)_3$, thus iron fertilizer application should be avoided in alkaline soils.

Activity 7: When chlorine gas and sulfur dioxide are simultaneously passed into the fuchsin solution, will the bleaching effect be stronger?

P: an enhanced bleaching effect; no recovery of color after heating; no bleaching effect at all.

O: When chlorine gas and sulfur dioxide are simultaneously passed into the fuchsin solution, no noticeable bleaching phenomenon occurs. (Teacher reminds students to consider from the perspective of oxidation-reduction reactions)

E: Chlorine gas reacts with sulfur dioxide when dissolved in water, forming H_2SO_4 and HCl, losing bleaching properties.

Fig. 1. A summary of part examples of students' responses to the 9 POE activities.

Results and Discussion

Data Analysis

An independent sample t-test was conducted to compare the pre-test means of students' scores between the experimental and control groups using SPSS (version 26) software. The results showed that the average scores for the experimental group (M=82.12, SD=3.31) and the control group (M=81.94, SD=3.67, P>0.05) were not significantly different. This indicates that the learning levels of the two groups of students, in terms of material classification, ion reactions, and redox reactions, were similar.

Table 1. Comparison of post-test scores on the SOLO taxonomy level between the control group and experimental group students.

SOLO Taxonomy Level	Score	Mean value (Average score ± Standard deviation)		P
		Experimental group (n=30)	Control group (n=30)	
Unistructural level	21	20.45±0.87	20.01±0.91	0.902
Multistructural level	39	33.42±1.47	32.54±2.05	0.046
Relational level	27	21.67±2.82	20.23±1.87	0.023
Extended Abstract level	13	8.98±0.95	7.32±1.09	0.034
Total score	100	84.52±6.23	80.10+5.92	0.038

According to Table 1, the average scores of the experimental group and the control group in the post-test are similar at the unistructural level, with a p-value of 0.902>0.05. This suggests that there is no significant difference in thinking level between the two classes at this level. Therefore, the POE strategy has a minimal impact on the unistructural thinking level of students. However, at the multistructural level, rela-

tional level, and abstract extended level, the average scores of the experimental group are higher than those of the control group, with p-values (0.046, 0.023, 0.034)<0.05, indicating significant differences in thinking level between the experimental and control groups at these three levels. The result of the experimental group (M=84.52, SD=6.23) and control group (M=80.10, SD=5.92), $p<0.05$. This indicates that the test scores of the experimental group students were significantly higher than those of the control group students, demonstrating a significant difference in the learning levels between the two groups.

Hence, this suggests that the POE strategy promotes the development of metacognitive conceptual understanding from a lower to a higher level. Additionally, both the experimental and control groups had the lowest frequency of reaching the extended abstract level, indicating that students currently face challenges in knowledge transfer and complex reasoning, which require enhanced training in the subsequent teaching.

Student Interviews

1.How do you perceive the application of the POE strategy in the classroom?

The students express a positive attitude towards the implementation of the POE strategy in the classroom. They find this approach to be more engaging and interesting, as it encourages active participation in critical thinking and observation, ultimately boosting their confidence in learning chemistry. Here are some students' responses:

- 'I thoroughly enjoy engaging in POE activities where I am required to carefully analyze problems and observe experimental phenomena before presenting my own ideas.'

- 'I have noticed a significant improvement in my confidence through participating in POE activities. I am now able to confidently express my thoughts, and both my teacher and classmates value and consider my viewpoints. As a result, my interest in chemistry has grown.'

2.How do you resolve cognitive conflicts when your predictions and observations do not align?

The students employ different strategies to resolve cognitive conflicts between predictions and observations. Some students engage in reflection upon these conflicts, while others rely on additional explanations provided by the teacher to correct their views. Here are a few examples of students' responses:

- 'I begin by reflecting on the disparities between my predictions and observations, and then analyze the underlying reasons using the knowledge I have acquired. I often make notes in my notebook to solidify my understanding, and find that reviewing these notes helps me recall the learned knowledge more effectively.'

- 'When confronted with unfamiliar knowledge, I find it challenging to provide a reasonable explanation as it surpasses my cognitive capacity. Only after receiving the teacher's explanation am I able to comprehend the true reason behind it.'

3.Do you prefer POE courses or traditional courses?

The students expressed a preference for the POE curriculum over traditional classes due to the opportunities it provides for active exploration and the chance to correct misconceptions. Here are some students' responses:

-'I prefer POE courses over traditional ones because they allow me to actively explore knowledge. After going through the stages of predicting, observing, and explaining, I have a comprehensive understanding of specific chemistry concepts and reactions.'

- 'In contrast, I find that I benefit more from POE courses. Even if I give the wrong answer, the observation stage encourages my thinking, and I can correct my response during the explanation stage. This process motivates me to actively participate in answering questions and ultimately boosts my confidence level.'

4.What is your impression of the topic 'reasonable use of iron fertilizer'?

The students mentioned that the theme of 'reasonable use of iron fertilizer' left a deep impression on them because it not only taught them chemistry knowledge but also helped them appreciate the value of the subject. Here are some students' responses:

- 'The theme of this activity was highly enjoyable as it kept me fully engaged in class without any distractions. Moreover, this class has significantly transformed my understanding of iron salts, enabling me to analyze practical problems from a theoretical knowledge perspective.'

- ‘It has sparked my interest in pursuing a chemistry major in college. I also find this class very valuable as it provides me with useful knowledge to enhance the health of the plants I enjoy taking care of.’

Based on the interview results, it is evident that students have a positive attitude towards the POE curriculum. The POE activities allow students to actively explore knowledge, think independently, and express their own perspectives. This process enhances students’ thinking abilities, boosts their confidence, and increases their interest in chemistry learning. The POE curriculum allows students to propose incorrect ideas during the prediction phase and discover the correct answers during the observation and explanation phases. This process encourages students to actively resolve cognitive conflicts, construct new knowledge, and develop their critical thinking skills. However, it is important for teachers to have an understanding of students’ cognitive levels beforehand, manage the pace and difficulty of the curriculum, and provide appropriate support and guidance in the classroom to facilitate the development of students’ understanding of elemental compounds.

Conclusion

This study focuses on investigating the impact of the Predict-Observe-Explain (POE) strategy on high school students’ conceptual understanding of elemental compounds. By comparing the test scores of the two groups of students, it can be observed that before using the POE strategy, there was almost no difference in the learning levels between the two groups. However, after using the POE strategy, the experimental group showed significantly higher test scores compared to the control group. The students in the experimental group exhibited better performance in terms of multistructural level, relational level, and extended abstract level. They were able to independently analyze unfamiliar problems and engage in complex reasoning. Therefore, the POE strategy facilitated the development of conceptual understanding ability among the students in the experimental group. Based on the analysis of interview results from the experimental group, students exhibited a positive attitude towards the POE strategy. They actively engaged in exploration and knowledge acquisition, which promoted critical thinking and enhanced their interest and self-confidence in learning chemistry. Furthermore, students were able to recognize the practical applications of chemistry in real life and appreciate its charm and unique value. Therefore, the POE strategy is considered to be a highly effective approach for enhancing students’ understanding of element compounds. Based on the findings of this study, it is recommended to apply the POE strategy in the instruction of ‘elemental compounds’ in high school chemistry courses. Future research can further investigate the effectiveness of the POE strategy in different units of chemistry courses.

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A Study on the Application of Intelligent Teaching Platforms in College English Teaching

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Abstract: The purpose of this paper is to introduce the background and significance of the application of intelligent teaching platform in college English teaching, to explore the integration of intelligent teaching platform in English teaching, and to analyze its impact on teaching practice and students' learning outcomes. This paper provides insights into the transformative role of these technologies in fostering personalized and adaptive learning experiences.

Keywords: Intelligent Teaching Platforms; College English Teaching; Learning Experiences

Introduction

Intelligent teaching platform is an educational technology application tool that uses artificial intelligence and computer technology, combines teaching theory and teaching practice, and provides students with personalized learning support and teachers' teaching assistance through intelligent, personalized and adaptive teaching mode.With the rapid development of information technology and the rapid progress of artificial intelligence, intelligent teaching platform has been widely used in college English teaching.

The application effect of intelligent teaching platforms in college English teaching is significant. The research shows that the intelligent teaching platform can improve students' learning enthusiasm and enthusiasm, and stimulate students' interest in learning.Students can participate in rich and diverse learning activities through the intelligent teaching platform, such as class discussion, team cooperation, and assignment submission, cultivating their cooperative spirit and innovation ability.

1. The Background and Significance of the Application of Intelligent Teaching Platforms in College English Teaching

1.1 The background of the application of intelligent teaching platforms in college English teaching

The application of intelligent teaching platforms in college English teaching has a profound background. With the continuous development of technology, intelligent teaching platforms have gradually become an important part of modern education, bringing convenience and efficiency to teaching and learning.

The rapid development of information technology provides strong technical support for the application of intelligent teaching platform in college English teaching. With the continuous improvement of computer technology and network technology, intelligent teaching platform has gradually become more and more advanced and intelligent.They can not only provide convenient course management, but also have powerful learning analysis and feedback functions, which can help teachers better understand students' learning status and needs, and improve teaching efficiency. Besides, with the popularity of mobile Internet, people's learning and living habits have also changed. More and more students like to use mobile devices for learning, and intelligent teaching platform can better meet the needs of students for mobile learning. They can provide students with convenient, anytime and anywhere learning resources and services, improve students' learning efficiency, and promote the popularization and application of mobile learning.

1.2 The significance of the application of intelligent teaching platforms in college English teaching

The application of intelligent teaching platforms in college English teaching has varied significance. First, it can effectively improve the efficiency of teaching and learning.Intelligent teaching platforms provide convenient course management, powerful learning analysis and feedback functions, which can help teachers better understand students' learning status and needs, and improve teaching efficiency.

Second, it can better promote students' autonomous learning and thinking ability. Intelligent teaching platforms provide students with a variety of learning resources and services, allowing students to choose according to their own interests and needs, and promote students' active and independent learning.

Third, it can promote the popularization and application of mobile learning. With the popularity of mobile Internet, more and more students like to use mobile devices to learn. Intelligent teaching platforms provide convenient, anytime and anywhere learning resources and services, which can meet students' needs for mobile learning, promote the popularization and application of mobile learning, and make education more inclusive and accessible.

2. The Integration of Intelligent Teaching Platforms in English Language Education

2.1 The current use of the integration of intelligent teaching platforms in language learning

Robert J. Blake said, "Technology integration in teaching and learning is an area of concern, interest, and discovery for many educators and administrators at all levels for multiple reasons, from enrollment management to enhanced learner engagement. The field of language learning is no exception, and guidance for those willing to explore various technologies is desirable. " (2013)

With the advancement of technology, the application of intelligent teaching platforms in English language education is becoming increasingly widespread.These platforms utilize advanced technology to provide students and teachers with a richer and more personalized learning experience.

Firstly, intelligent teaching platforms can provide a massive amount of learning resources. Students can independently choose suitable learning materials based on their own needs and interests. At the same time, these platforms also have intelligent recommendation functions, which can recommend suitable learning resources based on the learning situation of students, helping them better improve their learning efficiency.

Additionally, the intelligent teaching platform also provides teachers with rich auxiliary tools. Teachers can use these tools to better manage their courses, understand the learning situation of students, and conduct online Q&A. These tools can help teachers improve work efficiency and better meet the learning needs of students. For example, teachers can use some online games to attract students' attention and increase the fun of the classroom. "Tech-savvy teachers have also begun to embrace children's interest in digital play creating language learning opportunities through the use of computer games within an educational context - this is sometimes known as digital games-based learning (DGBL)." (Motteram 2013: 18)

2.2 The aspects to pay attention to when using intelligent teaching platforms in English language education

According to P. Hubbard, "In recent years, the range and complexity of both language learning technology and the environments in which learners utilize it have become more central factors in language education. Given the already stunning–and growing–number of technological options for language learning, teachers working with both established and emerging applications for learning tasks and activities face the problem of how their students can use them most effectively." (2013)

When integrating intelligent teaching platforms into English language education, there are several key factors that need to be noted.

Firstly, it is important to ensure the quality and diversity of learning resources provided by the platform. English language learning requires a lot of input and practice, therefore, platforms should provide rich learning materials, such as texts, listening materials, videos, and audio.

Secondly, the platform should have intelligent learning support functions. This means that the platform should be able to provide customized learning paths and recommendations based on learners' English proficiency and individual needs.In addition, the platform should also have intelligent evaluation and feedback functions so that learners can keep abreast of their learning progress and areas for improvement.

Thirdly, teachers should play an active role in the integration of intelligent teaching platforms. Teachers should, with the help of the platform, develop learning plans for students, provide learning resources and guidance, and monitor their learning progress.

Finally, it should be noted that although intelligent teaching platforms bring new opportunities for English language education, they

cannot completely replace the traditional face-to-face teaching methods of teachers. In English language education, the role of teachers is not only to provide knowledge, but also to guide, supervise, and encourage learners. Therefore, this factor should be fully considered when integrating intelligent teaching platforms to ensure that learners receive comprehensive and effective learning support.

3. Case Analysis of Intelligent Teaching Technology Application in the English Classroom

3.1 Case analysis of intelligent teaching technology application in English reading teaching

Teachers use the intelligent English reading teaching platform based on advanced artificial intelligence technology to provide students with personalized reading materials and learning suggestions. Firstly, students can log in this platform to finish basic reading ability test. Then the platform recommends suitable reading materials and difficulty levels for students based on test results. When students start reading, the platform monitors their reading speed and understanding level in real-time, and intelligently adjusts the difficulty and content of subsequent reading materials based on their performance. If they encounter new words or difficult sentences during the reading process, they can directly search or learn on the platform, which will provide detailed explanations and example sentences for students. Teachers regularly review students' learning reports, understand students' reading progress and mastery, and develop personalized teaching plans for different students based on the reports. At the end of the semester, the platform generates a comprehensive assessment report on students' reading ability for students and teachers to refer.

3.2 Case analysis of intelligent teaching technology application in English listening teaching

Teachers can use artificial intelligence teaching technology in English listening classes. Students can use it primarily to do shadowing, improve pronunciation accuracy, and record the pronunciation, laying the foundation for future pronunciation modifications. Additionally, students love to participate in the dubbing activity, which can stimulate students' interest in learning and change the pronunciation and intonation of college students. College English teachers can combine the specific content of teaching materials to help students practice interesting dubbing, so as to correct their English pronunciation, and English listening can be improved unconsciously. The third is to use artificial intelligence technology for data analysis.In order to improve students' English listening ability, it is necessary to identify the emphases and difficulties in listening skills. Through data analysis, targeted listening exercises are carried out for students to help them overcome the weak links of relevant knowledge points and achieve the purpose of accurate guidance.

Conclusion

In summary, intelligent teaching platforms have important value and application significance in college English teaching. However, in practical applications, there are still some problems and challenges that require further in-depth research and exploration. Only by constantly innovating and perfecting the design and function of intelligent teaching platform can it play a better role in college English teaching and improve students' learning effect and quality.In the future, we should pay attention to the training and guidance of teachers and students, strengthen the sharing and integration of various educational resources, and promote the wide application and effective development of intelligent teaching platform in college English teaching.

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Application of Logistic Regression Model in the Prediction of Air Quality Level in Zibo City

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Abstract: Objectively evaluating urban ambient air quality and analyzing its influencing factors are of great significance for understanding the current status of air quality and controlling pollution sources. In this paper, logistic regression analysis is carried out for 366 days of air quality data from January to December 2020 in Zibo City, Shandong Province, with air quality class as the categorical variable, and six variables, $PM_{2.5}$, PM_{10}, SO_2, CO, NO_2, O_3, are selected as pollution indicators affecting the air quality in Zibo City, and the stepwise regression method is utilized to establish a model and determine the weights of each pollution indicator. The established model is used to predict the samples of Zibo City, and the predicted data and actual data are compared to test the fit of the model. The results show that the logistic regression model fits well, and SO2 is the strongest factor affecting air quality, and the probability of air pollution is 1.035 times higher for every unit it increases and other variables remain unchanged, providing a basis for controlling the emissions of the primary pollution factors.

Keywords: Logistic; SPSS; Ambient air quality

1. Introduction

With the development of social industrialization and information technology, people's lives are becoming more and more convenient, but the environmental problems faced by mankind are also becoming more and more serious, of which air pollution is one of the topics worthy of people's attention.[1-2]. The level of environmental management in a city can reflect the state of ambient air quality, which directly affects the level of urban economic development and the quality of life of the people. With the sustained socio-economic development and the increasing intensity of regional development, the environmental pollution situation is worsening; and there are some cities where the degree of pollution is very obvious, thus affecting to a certain extent the speed of the city's economic development[3-5]. The increasing consumption of various types of energy and some other pollution generated by the daily production and life of residents have aggravated pollution and reduced the carrying capacity of the environment. Environmental pollution is not caused overnight, and the improvement of environmental quality also requires long-term governance and investment, which must start from multiple perspectives, and many aspects of joint efforts to form a long-term mechanism. Thus, quantitative and qualitative study of the ambient air quality situation in Zibo City, and analyze the influencing factors of ambient air quality, to understand the current situation of air pollution, looking for the source of pollution is of great significance, so as to provide guidance for the development of prevention and control measures and policies to effectively reduce pollution.

In recent years, Shandong Province is vigorously promoting the development of resource transformation, Zibo City, as an old industrial base in Shandong Province in the protection of environmental air quality has taken a series of strong measures to achieve significant achievements. Fan Xingxing[6] Characteristics, sources and impacts on human health of black carbon (BC) aerosol in Zibo in 2020-2022 were analyzed, and the results showed that BC was highest in winter, and the main sources were traffic emissions and coal combustion, and the impacts on children's lung function were high, but the study only selected one observation site and did not analyze different types of monitoring sites. Fang Bin.[7] According to the AQI and various pollutants data and corresponding meteorological data of Zibo City from 2013 to 2015, the air quality characteristics and its relationship with various meteorological elements were analyzed, and the results showed that $PM_{2.5}$ pollution was the most serious in Zibo City, and the high concentration values mostly appeared in winter. Hao Yujiao[8] The road mobile sources in Zibo were analyzed to study the pollutant emission characteristics of mobile sources with different fuel types, car models, emission stages and the concentration share of mobile source pollutants at the air monitoring stations, and the results showed that light-duty buses, heavy-duty diesel vehicles and off-road mobile machinery are the mobile sources with more pollutant emissions. This paper uses Logistic regression method to analyze the air pollution indicators in the city, which can objectively understand the current situation of ambient air quality in Zibo

City, and put forward relevant suggestions for improving the ambient air quality in Zibo City as well as provide a theoretical basis for managing air quality.

2. Data sources

In this article, we have collected 366 sets of air quality monitoring data of Zibo city from January to December 2020 from China Weather and the official website of China Environmental Monitoring General Station.[9] The data are complete and accurate. To get the quality level grading, you have to first determine the pollution level by the size of the AQI index. A total of six pollutants are involved in the calculation, namely: O_3 for 8 hours, PM_{10} for 24 hours, PM2.5 for 24 hours, CO for 8 hours, SO_2 for 24 hours, and NO_2 for 24 hours, and the unit of CO is mg/m^3, and the unit of the other five variables is ug/m^3 . Six variables, namely, $PM_{2.5}$, PM_{10}, SO_2, CO, NO_2, and O_3, are designated as dependent variables, which are summarized in Table 2-1.

Table 2-1 Data on Air Quality Categories and Their Associated Variables in Zibo City, 2019

dates	AQI	PM2.5	PM10	NO2	SO2	CO	O3_8h
2020/1/1	82	103	20	119	0.1	106	66
2020/1/2	162	63	23	2	1.6	51	28
2020/1/3	239	86	103	16	1.1	37	117
2020/1/4	292	86	21	36	0.3	12	23
2020/1/5	273	69	60	61	1.9	114	51
2020/1/6	90	111	28	45	1.5	88	70
2020/1/7	49	5	9	109	1.7	2	60
2020/1/8	72	17	31	22	0.1	49	92
2020/1/9	79	104	96	66	0.3	36	82
2020/1/10	137	44	81	34	1.3	96	109
2020/1/11	133	89	42	5	0.4	60	22
2020/1/12	84	8	79	67	0	115	112
2020/1/13	145	16	53	15	1.7	108	85
2020/1/14	85	59	97	57	0.4	110	82
2020/1/15	104	78	84	4	0	10	117
2020/1/16	158	84	81	33	0.5	85	53
2020/1/17	225	85	7	102	1.3	25	65
2020/1/18	212	3	54	114	0.2	72	107
2020/1/19	183	90	41	24	1.5	112	75
2020/1/20	86	72	41	5	0.4	3	64
2020/12/20	125	84	71	75	0.6	52	84
2020/12/21	137	59	77	50	1.6	70	45
2020/12/22	129	33	4	55	0.2	51	23
2020/12/23	125	93	56	76	0.8	43	114
2020/12/24	109	89	15	43	0	81	85
2020/12/25	99	0	23	53	1.4	5	44
2020/12/26	158	110	58	53	1.3	28	103
2020/12/27	204	51	34	3	1.4	68	36
2020/12/28	267	79	8	25	1.8	111	5
2020/12/29	43	46	117	47	1.8	95	38
2020/12/30	50	118	32	18	1	49	96
2020/12/31	58	19	62	4	1.9	53	97

3. Logistic regression model

Logistic regression model as a probabilistic nonlinear regression model, with the probability of occurrence of an event as the dependent variable and the influencing factors as the independent variables, is suitable for the case where the dependent variable is a categorical variable, and has more applications in the fields of society and economy, etc.[10] . Let an effect outcome indicator y be a dichotomous variable that takes the value of y = l to indicate that an effect occurs, and y = 0 to indicate that an effect does not occur. The risk factors affecting the effect outcome y are covariates (i.e., independent variables, also known as explanatory or forecast variables, which can be either continuous or discrete), and there are x_1. x_2.xm There are a total of m. The probability that the dependent variable will take 1, P(y=1 ||x) is the object to be studied, called Logistic linear regression model, which is a generalized linear model, and the method of linear modeling can be applied systematically.

In this study, we used the daily air quality level of whether the air quality level is polluted or not as a dichotomous variable and transformed it into a dichotomous dummy variable, where the air quality level of "excellent", "good" is transformed into 0, "mild pollution", "moderate pollution", "heavy pollution" and "severe pollution" are transformed into 1, i.e., those assigned a value of 0 are ", "moderately polluted", "heavily polluted" and "severely polluted" is converted to 1, i.e., the value of 0 is assigned to the value of "not polluted", and the value of 1 is "polluted", using SPSS software for binary logistic regression analysis.

$$\ln\frac{P}{1-P} = \alpha + \beta_1 x_1 + \beta_2 x_2 + \ldots + \beta_m x_m \quad (1)$$

where β_i (i=0,1,2,3, ..., m) is the regression coefficient.

where $\frac{P}{1-P}$ denotes the dominance ratio (the ratio of the probability of the event occurring to the probability of the event not occurring), the parameter to be estimated a, theβ_1, .β_2, ..., andβ_m reflects the change in the dominance ratio. If β_i is positive, its opposition value (index) must be greater than 1, then the dominance ratio will increase; conversely, if β_i is negative, the dominance ratio decreases. The formula for the probability P is:

::

$$P = \frac{\exp(\alpha+\beta_1 x_1+\beta_2 x_2+\ldots+\beta_m x_m)}{1+\exp(\alpha+\beta_1 x_1+\beta_2 x_2+\ldots+\beta_m x_m)} \quad (2)$$

4. Analysis of results

The starting block 0 is the model with only constant terms for the independent variables, which can be referred to as the baseline or null model. The model is given by considering variables that are selected into but not in the equation, and the null hypothesis (H0) is that no improvement will occur if a variable is included in the current model.

The data in Table 2-1 were imported into SPSS software to obtain the correlation statistics in the logistic regression equation (Table 4-1), and the results showed that the significance test values (Sig. values) for testing PM10, SO2 , CO and O3_8h- were all less than 0.05, which indicated that there was an improvement in including them in the model, but the Sig. values for PM2.5 and NO2 were greater than 0.05, which means that PM2.5 and NO2 will not improve the model. So remove PM2.5 and NO2 and proceed to step 2 of the process.

Table 4-1 Variables not in the equation

			Score	degrees of freedom	significance
Step 0	variant	PM2.5	2.573	1	.109
		PM10	4.669	1	.031
		NO2	.425	1	.514
		SO2	5.729	1	.017
		CO	6.126	1	.013
		O3_8h	8.124	1	.004
	Overall statistical information		33.015	6	.000

Table 4-2 shows the results of two Hosmer tests, P1=0.454>0.05, P2=0.895>0.05, accepting the null hypothesis (the null hypothesis is that the observed data and the regression model fit well, the alternative hypothesis is that the fit is not good), which means that the binary logistic regression model established by the current data and the real data fit well.

Table 4-2 Hosmer and Lemeshow tests

Step length (T)	chi-square	degrees of freedom	significance
1	7.793	8	.454
2	3.913	8	.865

Table 4-3 shows the predicted values of the real data using the binary logistic regression fitting equation. In the first regression processing, the correct rate of prediction using the binary logistic regression fitting equation is 63.4%, and after the processing in step 2, the final correct rate of prediction is 64.8%, which indicates that the binary logistic regression fitting equation is more effective.

Table 4-3 Classification Tablea

observed value			projected value		
			quality level		Percentage correct
			non-contamination	contamination	
Step 1	quality level	non-contamination	174	44	79.8
		contamination	90	58	39.2
	Overall percentage				63.4
Step 2	quality level	non-contamination	176	42	80.7
		contamination	87	61	41.2
	Overall percentage				64.8

a. A cut-off value of .500

Checking Table 4-4, at the end of Step 2, the coefficients of the remaining five variables are suggested to be significant by the Wald test P-value; further checking their corresponding coefficients, the B-values are all greater than 0, which indicates that PM2.5, PM10, SO2, and O3_8h have a positive effect on the AQI, and the larger the AQI the more serious the air pollution condition is, therefore, the larger the concentration of PM2.5, PM10, CO, and O3_8h, the Therefore, the larger the concentrations of PM2, PM, CO, O3_8h are, the worse the air quality is. The B-value of NO is -0.049, which indicates that it is negatively correlated with the air quality level. The “exp (B)” value in the table is the OR value, which is specifically explained as follows: PM2.5 concentration increases by one unit, the possibility of air pollution is 1.107 times; PM10 concentration increases by one unit, the possibility of air pollution is 1.030 times; SO2 concentration increases by one unit, the possibility of air pollution is 1.31 times; SO2 concentration increases by one unit, the possibility of air pollution is 1.3 times; SO2 concentration increases by one unit, the possibility of air pollution is 1.3 times. The possibility of air pollution is 1.318 times higher for each unit increase in SO2 concentration; NO2 is a protective factor, indicating that the air treatment of nitrogen oxides has been effective. The possibility of air pollution increases by 6.2% for each unit increase in O3_8h concentration.

Table 4-4 Variables in the program

		B	S.E.	Wald	degrees of freedom	significance	Exp(B)	95% C.I. for EXP(B)	
								lower limit	limit
Step 1	PM2.5	.006	.003	2.813	1	.094	1.006	.999	1.012
	PM10	.006	.003	3.159	1	.075	1.006	.999	1.013
	NO2	.005	.003	2.012	1	.156	1.005	.998	1.012
	SO2	.039	.018	4.766	1	.029	1.040	1.004	1.077
	CO	.012	.003	13.503	1	.000	1.013	1.006	1.019
	O3_8h	.008	.003	7.753	1	.005	1.008	1.002	1.013
	constant	-2.626	.467	31.577	1	.000	.072		
Step 2	PM10	.006	.003	3.196	1	.074	1.006	.999	1.013
	SO2	.035	.017	3.976	1	.046	1.035	1.001	1.071
	CO	.013	.003	14.679	1	.000	1.013	1.006	1.020
	O3_8h	.007	.003	6.881	1	.009	1.007	1.002	1.013
	constant	-2.354	.422	31.168	1	.000	.095		

The independent variables contained in the model obtained in the second step are PM_{10}, SO_2, CO and O_3, a total of five variables, and the Sig. value of SO_2, CO and O_3 is less than 0.05 (indicating statistical significance) and the significance is also less than 0.05; further check the corresponding coefficients, the value of B is greater than 0, which indicates that they all have a positive effect on the AQI, and the larger the AQI, the more serious the air pollution situation is; therefore, the larger the concentration of PM, SO_2, CO and O_3_8h, the worse the air quality is; the column B in the table is the constant and the coefficient of the independent variable (weights). The larger the air pollution is, the more serious it is, so the larger the concentrations of PM_{10}, SO_2, CO, O_3_8h are, the worse the air quality is; the column of B in the table is an estimate of the constant and the coefficients of the independent variables (weights), and Exp(B) is the dominance ratio, which is generally referred to as the odds ratio (OR), and it can be viewed as a ratio of the occurrence category of the independent variables to the occurrence category of the independent variable for each increase of a unit, while the other variables are kept unchanged. It can be viewed as the multiple of the change in the odds ratio of the occurrence category caused by each unit increase in the independent variable when all other variables are held constant (when the probability of occurrence of an event is not very large, it can be approximated as the multiple of the change in the probability of occurrence of the event caused by each unit increase in the independent variable). In this final model, we can see that the coefficient of SO_2 is the largest, so SO_2 is the strongest influence on air quality, it increases by one unit, other variables remain unchanged, the probability of air pollution is 1.035 times the original; similarly, CO increases by one unit, the probability of air pollution is 1.013 times the original, O_3 increases by one unit, the probability of air pollution is 1.007 times the original. 1.007 times the original.

Using the logistic regression model, the final predictive model is as follows:

$$P = \frac{\exp(0.006x_1 + 0.35x_2 + 0.13x_3 + 0.07x_4 - 2.354)}{1 + \exp(0.006x_1 + 0.35x_2 + 0.13x_3 + 0.07x_4 - 2.354)}$$

5. Conclusions and recommendations

In this study, according to the categorization characteristics of whether the air is polluted in the air quality grade, based on the binary logistic regression method to screen the pollution indicators, we established the air quality grade model of Zibo City, determined the factors affecting the air quality in Zibo City as SO_2, CO, O_3 and PM_{10}, and derived the weight and advantage ratio of the pollution indicators, of which SO_2 has the greatest impact on the air quality. It is applied to the evaluation and prediction of the actual air quality, and a better prediction effect is achieved.

Zibo city government should further accelerate the conversion of old and new kinetic energy and industrial upgrading, especially for enterprises that will produce sulfide focus on governance, optimize the structure of energy consumption and the structure of import and export commodities trade, accelerate the management of the number of small and heavy polluting enterprises, air pollution is serious disorder,

the transformation of large and heavy polluting enterprises, and further improve their energy utilization and recycling rate, reduce the pollution of the air.

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Research on the Impact of Obstacles at Bottlenecks on the Efficiency of Crowd Evacuation

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Abstract: With economic development and pandemic relief, crowd gatherings have become a focal point. Despite academic interest in crowd evacuation due to sudden events, the influence of exit obstacles has been neglected. This paper builds on prior research, presenting a social force model for emergency crowd evacuation under obstacle diversion. It explores the diverse effects of various obstacles on evacuation efficiency through experiments, mathematical modeling, and simulations. The study aims to offer scientific insights for urban planning based on the analysis of evacuation outcomes under different obstacle configurations.

Keywords: Evacuation of Crowds; Obstacles; Evacuation Efficiency; Exit Planning; Social Force Model

1. Introduction

With economic development, the surge in crowd gatherings is a notable social phenomenon. This has sparked academic interest in crowd evacuation during sudden events like earthquakes, fires, and terrorist attacks. Existing research predominantly focuses on crowd characteristics, interactions, and exit choices, neglecting the impact of exit obstacles on evacuation.

Some scholars have explored methods to enhance evacuation efficiency by manipulating obstacle settings through experiments and simulations [1–3]. For instance, Zhao et al. found that a single square obstacle had minimal effect on evacuation time, while two square obstacles or a rectangular barrier significantly reduced evacuation time, improving efficiency [1]. Wang et al. influenced crowd density distribution in bottleneck areas by placing isolation barriers at exits, enhancing evacuation efficiency by weakening internal interactions within the crowd [2]. However, past studies often overlooked the impact of differences between obstacles, such as shapes, quantities, and layouts.

In this context, this paper extends previous research by proposing a social force model for emergency crowd evacuation with exit obstacles. The objective is to explore the impact of obstacles on evacuation efficiency and the microscopic mechanisms alleviating congestion. Through a systematic examination of obstacle settings, we emphasize the importance of factors like shapes, quantities, and layouts. This research contributes to understanding crowd evacuation behavior, enhancing urban safety, and optimizing emergency plans. Combining empirical research and theoretical models, we aim to offer accurate guidance for future urban planning and public safety management.

2. Model Framework

2.1 Simulation Scenario

For result consistency, the simulation scenario is a closed area of 8m × 10m with a single 1m-width exit, aligning with safety standards. Various obstacles, including single or symmetrically distributed pairs of circular, square, and trapezoidal columns, are placed near the exit to study the impact of different shapes and quantities on crowd evacuation efficiency.

When setting obstacles, it is vital to make their areas nearly equal for consistent variables. To simplify calculations, set the areas of different obstacles to approximately 2m2 each. For instance, the circular obstacle has a radius of 0.798m, the square obstacle can be 1.4m × 1.4m, and the trapezoidal obstacle has upper and lower base lengths of 1.5m and 3.5m, with a height of 0.8m.

2.2 Evolution Rules of the Model

In 1995, German scholar Helbing[3,4], based on Newton's Second Law, integrated and supplemented the forces acting on pedestrians during walking, proposing the Social Force Model. The dynamic equation of the model is as follows:

$$m_i \frac{dv_i(t)}{dt} = f_i^0 + \sum_{j(\neq i)} f_{ij} + \sum_w f_{iw} \qquad (2-1)$$

In equation (2-1), Helbing categorizes forces during walking into three types: self-propulsion force f_i^0, interaction force between pedestrians f_{ij}, and interaction force between pedestrians and the environment f_{iw}. Here, m_i is the pedestrian's mass, and $\frac{dv_i(t)}{dt}$ is the pedestrian's acceleration. This paper extends Helbing's Social Force Model by including interaction forces between pedestrians and exit obstacles, aiming to realistically capture pedestrians' movements when detouring around obstacles. The dynamic equation is as follows:

$$m_i \frac{dv_i(t)}{dt} = f_i^0 + \sum_{j(\neq i)} f_{ij} + \sum_w f_{iw} + \sum_o f_{io} \qquad (2-2)$$

In equation (2-2), the interaction force between pedestrians and exit obstacles is denoted as f_{io} and its expression is given by:

$$f_{io} = \left\{ A exp\left[\frac{r - d_{io}}{B} \right] \right\} n_{io} + K\Theta(r - d_{io})(v_i \cdot t_{io})t_{io} \qquad (2-3)$$

In equation (2-3), d_{io} is the distance from pedestrian i to the center of the obstacle. For a circular obstacle, $r = r_i + r_o$, where r_i and r_O are the radius of pedestrian i and the obstacle, respectively. For square r trapezoidal obstacles, $r = r_i$ and the interaction force between pedestrian i and the obstacle is the vector sum of the forces exerted by the pedestrian on each boundary of the obstacle. $\Theta(x)$ is a piecewise function used to determine contact between pedestrians: $\Theta(x) = x$ if $x > 0$ (contact) and $\Theta(x) = 0$ if $x \leq 0$ (no contact).

3. Simulation Analysis and Discussion

3.1 Impact of Obstacles on Crowd Evacuation Efficiency

We experimentally vary the distance (d) from obstacles to the exit to investigate if obstacle presence reduces evacuation time and enhances efficiency. Figure 4.1 displays numerical simulation results for a scenario with two obstacles. Each data point represents the average of multiple samples, mitigating the impact of initial pedestrian distribution before evacuation.

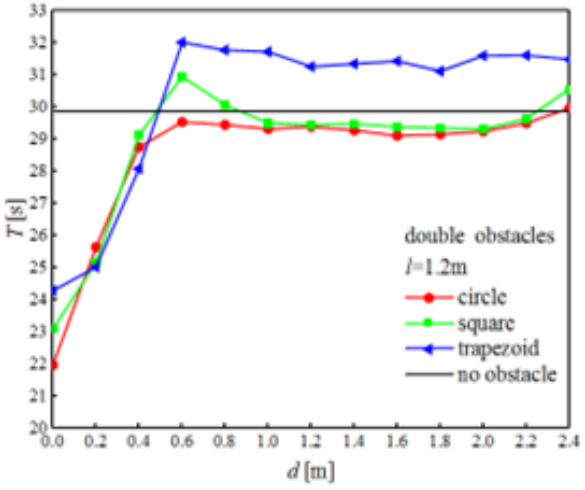

Figure 3.1 Diagram of the relationship between evacuation time T and the distance d from obstacles to the exit

Figure 3.1 compares evacuation times with and without obstacles symmetrically placed in front of the exit. Notably, when two obstacles are symmetrically positioned near exit walls (d=0m), all three obstacle shapes significantly reduce evacuation time, demonstrating higher efficiency than without obstacles. The experiments affirm that strategically placing dual obstacles positively alleviates bottleneck issues at evacuation exits, enhancing evacuation efficiency.

Furthermore, when $0 < d < 0.6$m, the evacuation time gradually increases with the increase of d, and the contribution of obstacles to improving evacuation efficiency decreases as the distance from obstacles to the exit increases. When $d > 0.6$m, the time required for evacuation remains almost constant with increasing d.

3.2 Mechanism Analysis of Obstacle Alleviating Arching Effect

Figure 3.2 illustrates the spatiotemporal evolution pattern during crowd evacuation to further explore how obstacles alleviate congestion bottlenecks. Pedestrians are color-coded based on the magnitude of the squeezing force (f_{push}) they experience, with darker colors indicating higher forces.

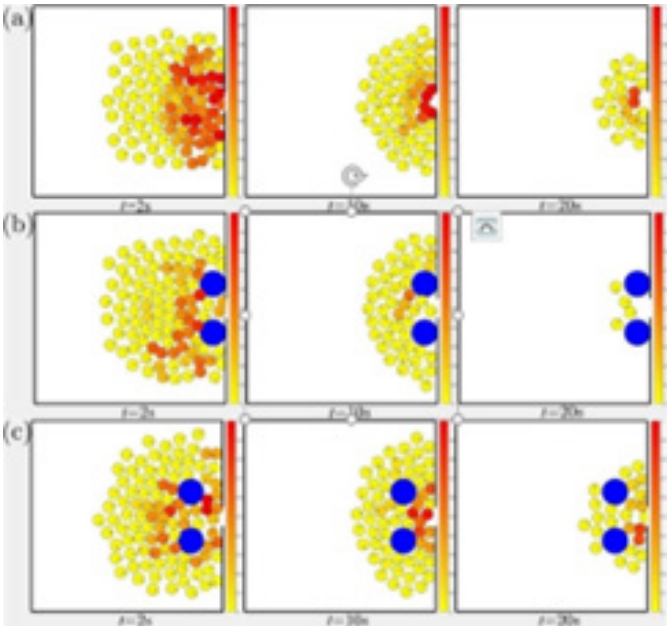

Figure 3.2 Temporal and spatial patterns of crowd evacuation process under different distances from obstacles to exits. (a) No obstacle; (b) D=0m; (c)D=1m.

In Figure 3.2 (a), during the initial evacuation stage, the crowd quickly gathers toward the safe exit. However, without exit obstacles, a wide congestion area forms, causing significant squeezing forces (f_{push}) and the development of an arching effect. This impedes quick pedestrian escape and, in severe cases, may lead to stampede incidents, posing life-threatening risks. The bottleneck induced by the arching effect takes a long time to dissipate, resulting in prolonged evacuation times.

Contrastingly, Figure 4.2 (b) depicts the scenario with symmetrically placed obstacles near the exit. Initially, the crowd gathers near the exit, but the obstacles effectively separate them, reducing the probability of contact and squeezing. The obstacles act as a buffer, slowing down pedestrians behind them, creating an arching effect that shifts the occurrence to behind the obstacles. This minimizes direct contact between pedestrians, resulting in a low number and proportion of collisions in the critical area in front of the exit. Consequently, this configuration allows for a rapid escape, improving evacuation efficiency. When two circular obstacles are symmetrically placed away from the exit (d=1m) (as shown in Figure 4.2(c)), evacuation blockage occurs earlier, increasing the distance for pedestrians to reach the safety exit. Simultaneously, pedestrians on either side of the obstacles converge towards the exit through the space between the obstacles and the wall, creating strong mutual squeezing forces. This results in a reduced efficiency of crowd passage at the exit, leading to a longer evacuation time.

4. Article Summary

This study focuses on addressing congestion bottlenecks to minimize evacuation time and ensure personal safety in scenarios with obstacles at exits. We present a social force model for crowd emergency evacuation, exploring the impact of obstacles with different shapes, quantities, and layouts on evacuation efficiency.

After a thorough investigation, key conclusions reveal that symmetrically placing two obstacles near exit walls with a wide gap, whether circular, square, or trapezoidal, effectively reduces evacuation time. Circular obstacles show a more significant improvement in efficiency.

In summary, this study offers valuable insights for designing and optimizing exits in crowded locations. Understanding how obstacle shapes, quantities, and layouts affect evacuation efficiency provides a scientific basis for future planning, contributing practically to enhanc-

ing urban safety and optimizing emergency management strategies.

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