

International Education Forum

Editor-in-Chief

Sarab Abu-Rabia-Queder

Ben-Gurion University, Israel

BIO-BYWORD SCIENTIFIC PUBLISHING PTY LTD

(619 649 400)

Level 10

50 Clarence Street

SYDNEY NSW 2000

Copyright © 2025. Bio-Byword Scientific Publishing Pty Ltd.

Complimentary Copy



International Education Forum

Focus and Scope

International Education Forum (IEF) is an international, peer reviewed and open access journal that aims to promote the development of education around the world, promote new educational concepts and methods, and demonstrate new achievements in the field of education and teaching. Manuscripts are encouraged to be submitted as original article, review, case report, short communication and letters. The covered topics include, but are not limited to: educational internationalization, educational diversification, vocational education, basic education development, curriculum development, educational psychology, educational technology, learning and educational model reform, educational assessment, special education, etc.

About Publisher

Bio-Byword Scientific Publishing is a fast-growing, peer-reviewed and open access journal publisher, which is located in Sydney, Australia. As a dependable and credible corporation, it promotes and serves a broad range of subject areas for the benefit of humanity. By informing and educating a global community of scholars, practitioners, researchers and students, it endeavors to be the world's leading independent academic and professional publisher. To realize it, it keeps creative and innovative to meet the range of the authors' needs and publish the best of their work.

By cooperating with University of Sydney, University of New South Wales and other world-famous universities, Bio-Byword Scientific Publishing has established a huge publishing system based on hundreds of academic programs, and with a variety of journals in the subjects of medicine, construction, education and electronics.

Publisher Headquarter

BIO-BYWORD SCIENTIFIC PUBLISHING PTY LTD

Level 10

50 Clarence Street

Sydney NSW 2000

Website: www.bbwpublisher.com

Email: info@bbwpublisher.com

Table of Contents

- 1 Strategies for Continuously Improving College Students' Physical Health from the Perspective of Cultivating Exercise Habits**
Zhilin Gao
- 7 The Application of Digital Multimodal Resources in Business English Classroom Teaching**
Wenmin Chen
- 14 Research on the Teaching Reform of Medical and Pharmaceutical Majors in Higher Vocational Colleges under the Background of Artificial Intelligence**
Xianlin Yuan
- 21 Exploration and Practice of Integrated Teaching Combining “Composition Design and PS Tools”**
Xiongwen Gan, Wenjing Li
- 31 Enhancing Space English Teaching: Application of the BOPPPS Model in Space English Classrooms**
Min Qiu
- 36 Research on the Reform of College English Oral Teaching in Applied Undergraduate Colleges**
Xu Wu
- 44 Research on Factors Influencing University Students' Continuance Intention to Use Generative Artificial Intelligence**
Yue Zhang
- 56 Current Status and Implications of Online Autonomous Learning in College English Based on Online Learning Data: A Case Study of Learning Data from the “Lighthouse Reading” Platform**
Qiaoling Li
- 61 Research on the Reform of Ideological and Political Education in Preschool Education Major Courses in Colleges and Universities**
Linglan Gao

- 68 Practical Paths for Higher Vocational Education to Empower Rural Revitalization in the Kangba Region**
Huai Deng
- 74 How to Prepare a Music Lesson by Analyzing Teaching Materials: Understanding the Non-musical and Musical Languages in Music Teaching Materials**
Ya Liu
- 80 Research on the Development and Application of Digital Resources in College Physical Education under the Background of Blended Teaching: Taking the Empirical Study of Swimming Teaching as an Example**
Yang Xu
- 86 Research on the Application of the Transparency Principle in the EU Artificial Intelligence Act**
Mengting Zhu
- 92 Exploring the Paths of Ideological and Political Education in the Recommendation System Course**
Jianxi Zhao, Qingrong Zou
- 98 Research on the Reform Path of College Physical Education from the Perspective of Physical Health**
Wuqi Zhao
- 105 Research on the Path of Implementing “Classroom Revolution” in Specialized Basic Courses of Higher Vocational Colleges: A Case Study of the Course “Fundamentals and Applications of Finance”**
Jiangbo Wang, Songbin Wu, Qi Liao
- 113 Research on the Challenges and Pathways of AI-Driven Digital Transformation in University Aesthetic Education**
Nannan Cao, Qin Tong

Strategies for Continuously Improving College Students' Physical Health from the Perspective of Cultivating Exercise Habits

Zhilin Gao*

Niigata University, Niigata 950-2102, Japan

**Author to whom correspondence should be addressed.*

Copyright: © 2025 Author(s). This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0), permitting distribution and reproduction in any medium, provided the original work is cited.

Abstract: Focusing on the continuous improvement of college students' physical health, this paper deeply analyzes the current physical health and exercise habits of college students, and clarifies the relationship between physical health and exercise habits. Good exercise habits have a positive impact on the improvement of college students' physical health, while poor physical health is a major obstacle to the formation of good exercise habits among college students. Through the implementation of various strategies to strengthen the physical exercise of college students, the aim is to provide an important guarantee for the sustainable improvement of college students' physical health.

Keywords: Exercise habits; Cultivation; College students; Physical fitness

Online publication: September 18, 2025

1. Introduction

From the viewpoint of the actual situation of college students' physical health at this stage, it is not optimistic. Therefore, the school must pay enough attention to the sustainable improvement of college students' physical health from the perspective of the development of sports habits, and encourage college students to gradually form good sports habits, so as to lay a good foundation for the realization of the goal of the sustainable improvement of college students' physical health. This paper analyzes the current situation of college students' physical health and exercise habits, and proposes effective strategies for the continuous improvement of college students' physical health^[1].

2. Current situation of physical health among college students

In the field of education and even throughout society, the physical health of college students has received

increasing attention and emphasis. Through the monitoring of the physical health of college students across the country, it is found that the physical health of college students shows a downward trend. In recent years, the number of obese college students has been increasing continuously. Besides having a negative impact on the physical image of college students, obesity may also induce some chronic diseases, such as diabetes and cardiovascular diseases, posing a serious threat to the physical health of college students ^[2]. From the perspective of physiological functions, both the endurance and cardiopulmonary functions of college students are not optimistic. In the annual physical fitness tests for college students, the number of college students who pass the long-distance running test is decreasing, indicating that college students have relatively low endurance and their cardiopulmonary functions are unable to support them in completing slightly more intense sports events. In addition, many college students lack a regular schedule. They often stay up late playing games, watching TV series, etc., and their sleep time is obviously insufficient, which leads to listlessness in their studies and life the next day. The diet also lacks rationality. College students usually like to eat some takeout food with high oil and salt content. The daily intake of vegetables and fruits is obviously insufficient. This not only fails to provide the body with comprehensive nutrients but may also lead to problems with the gastrointestinal tract. Moreover, many college students lack physical exercise. They spend most of their spare time playing with their mobile phones in the dormitory and seldom go to the playground to exercise independently. Their physical functions and immunity are constantly declining, and they often have fevers, colds, etc. ^[3]. In the information age, the lifestyle of college students has undergone significant changes. Many college students are addicted to the virtual world of the Internet and seldom go outdoors for activities. Playing with mobile phones for a long time, apart from causing a decline in eyesight, may also lead to problems with the cervical vertebrae.

3. College students' exercise habits

The exercise habits of college students show diverse characteristics. In terms of exercise frequency, some college students take exercise as a part of their lives and have a regular exercise habit, exercising at least three times a week. There are also some college students who exercise at a relatively low frequency, or even less than once a week. In terms of the duration of exercise, some college students can persist in exercising for half an hour to one hour each time. Not only can they achieve certain exercise effects, but they will also not feel overly tired, and it will not affect their normal study and life ^[4]. There are also some college students who exercise for a relatively short period of time, with each session lasting less than 30 minutes. In terms of exercise intensity, many college students mainly engage in moderate-intensity sports, such as table tennis, badminton, and jogging. This kind of sport can not only be well tolerated by college students' bodies but also provide certain exercise for their muscle strength and cardiopulmonary function. Some college students also prefer sports with relatively high intensity, such as football matches and basketball games. The competitive feeling and excitement of these sports have a great appeal to them. Some college students, on the other hand, prefer low-intensity sports such as yoga and walking, and they pay more attention to the relaxation and comfort of sports.

4. The relationship between exercise habits and physical health

4.1. The positive impact of exercise habits on physical health

Developing good exercise habits can empower the continuous improvement of college students' physical health. College students with good exercise habits can significantly enhance their physical health. For instance,

after a period of aerobic exercise, such as cycling, swimming, and running, the cardiopulmonary function of college students can be enhanced. For instance, after a period of aerobic exercise, such as cycling, swimming, and running, the cardiopulmonary function of college students can be enhanced. Flexibility exercises, such as stretching and yoga, can enhance the coordination and flexibility of college students' bodies.

Moreover, appropriate physical exercise also has a very good stimulating effect on the immune system of college students, which can make immune cells more active and significantly increase their number, helping to enhance the body's ability to resist pathogens in college students^[5]. In addition, good exercise habits are also conducive to maintaining the mental health of college students. Under the influence of academic pressure, social confusion, career planning, and other factors, college students are prone to negative psychological states such as depression and anxiety. Exercise can prompt the brain to secrete neurotransmitters such as serotonin and dopamine. Dopamine can make college students feel happy. Serotonin can help college students maintain stable emotions and is conducive to improving their mental health.

4.2. Poor physical health hinders exercise habits

Poor physical health among college students is a major obstacle to their formation of good exercise habits. Some college students have relatively poor physical functions. After doing even a little exercise of a certain intensity, they experience a rapid heartbeat, shortness of breath, and muscle soreness. These discomforts make them rather resistant and fearful of exercise, which seriously affects their enthusiasm for participating in sports. Some college students with weak heart and lung functions often feel short of breath and have difficulty completing sports such as basketball and long-distance running. Over time, they will give up such sports. Some college students with poor physical flexibility and coordination often make frequent mistakes when engaging in sports that require skills, such as table tennis and badminton, which dampens their self-confidence and gradually makes them lose interest in sports. In addition, college students with poor physical health are often more worried about getting injured during sports, which restricts their exercise behavior. Especially those who have been injured during sports, they tend to be more cautious during sports and even directly refuse to exercise, seriously hindering college students from developing good exercise habits^[6].

5. Effective strategies for the continuous improvement of college students' physical fitness and health from the perspective of cultivating exercise habits

5.1. Stimulate interest in exercise and ignite the passion for exercise

Interest can provide an important driving force for college students to develop good exercise habits. Schools need to enhance the innovation of physical education teaching methods and content. By carrying out diverse sports activities, they can continuously stimulate college students' interest in sports and ignite their enthusiasm for sports, thereby laying a solid foundation for the continuous improvement of college students' physical health. On the one hand, it is necessary to break away from the previous teaching model of physical education courses. By introducing fashionable and emerging sports such as street dance, roller skating, archery, and rock climbing, it is ensured that the diverse sports needs and interests of college students can all be met^[7]. These sports events are both challenging and interesting, which can effectively stimulate the enthusiasm of college students to participate. Schools also need to carry out physical education teaching activities through diverse methods, break away from the previous single "indoctrination" teaching mode, and increase the interest of physical education teaching by means of games, competitions, and scenario creation, so that college students

can better experience the charm of sports. On the other hand, the school regularly organizes college students to carry out a variety of sports activities, continuously stimulating their interest in sports. In addition to regular basketball games, volleyball games, football games, sports meetings, etc., it is also necessary to regularly organize college students to carry out outdoor expansion activities, sports culture festivals, fun sports meetings, etc. In outdoor expansion activities, college students' willpower can be well-trained. The holding of the sports culture festival can enhance college students' awareness of sports. The fun sports meeting can encourage college students to continuously improve their physical health in a pleasant and relaxed sports atmosphere.

5.2. Teach scientific methods and consolidate the foundation of sports

Only when college students master scientific exercise methods can they ensure the effectiveness of their exercise while avoiding injuries during the process. Therefore, from the perspective of cultivating exercise habits, in the process of continuously improving the physical health of college students, schools need to regularly organize and carry out exercise knowledge training and special lecture activities, provide personalized guidance on college students' exercise, and guide them to reasonably formulate exercise plans based on their own conditions. Schools can regularly invite professional doctors, sports coaches, and sports scholars to the campus to explain sports-related knowledge to college students. The main contents include the prevention and treatment of sports injuries, sports physiology, sports nutrition, etc. For example, when carrying out lectures on the prevention and treatment of sports injuries, college students are introduced to common sports injuries in detail, including the causes of injuries, symptoms, and emergency treatment methods, and through on-site demonstrations, college students are shown the correct use of bandages and cold and hot compresses, so as to improve the basic ability of college students to deal with sports injuries^[8]. In the process of providing personalized guidance for college students' sports, it is necessary to combine their physical health conditions, sports interests, and sports goals for guidance. For college students who aim to lose weight, they can be guided to exercise by combining aerobic exercise with strength training, and scientific guidance can be provided on their daily diet. For college students who aim to improve their sports performance, in addition to attaching importance to correcting their incorrect sports movements, it is also necessary to help them formulate personalized training plans based on their conditions to enhance their physical fitness and athletic ability, etc. In addition, with the help of sports apps and intelligent sports equipment, the data generated by college students during their exercise can be monitored in real time, such as calories burned, heart rate, exercise duration, and exercise distance. Through the analysis of the collected data, college students can be guided in a timely manner to adjust their exercise plans, thereby ensuring the effectiveness of the exercise.

5.3. Optimize the sports environment and ensure sports conditions

From the perspective of cultivating exercise habits, in the process of continuously improving the physical health of college students, it is also necessary to pay attention to optimizing the exercise environment, so as to provide college students with good exercise conditions. Schools should appropriately increase investment in sports facilities, rationally plan sports fields, and at the same time establish a complete maintenance and management mechanism for sports facilities, so as to create comfortable and convenient sports conditions for college students^[9].

Appropriate financial input should be increased to introduce sports facilities. On the one hand, sports facilities and equipment should be improved; on the other hand, old and damaged sports facilities and equipment should be replaced in a timely manner. It is also necessary to enhance the construction of modern

gymnasiums and equip them with fitness equipment such as barbells, dumbbells, spinning bikes, and treadmills according to the needs of college students. It is necessary to expand and maintain sports fields such as tennis courts, basketball courts, football fields, track and field fields, etc., to ensure that the fields are safe and level enough. To prevent college students' sports from being affected by the weather, the construction of indoor sports venues should also be strengthened, such as table tennis courts and badminton courts. In some newly built modern gymnasiums in colleges and universities, in addition to these advanced sports facilities and equipment, intelligent management systems have also been introduced. College students can log in to the app at any time to make reservations for the use of sports equipment and sports fields, thereby achieving efficient utilization of sports equipment and sports fields. The rational planning of sports venues on campus should be based on the characteristics of each sports event and the sports needs of college students, and a scientific layout should be carried out. Large sports fields, such as football fields and track and field fields, should be set up in the center of the campus sports venues to facilitate the use of college students. Small sports fields should be set up around teaching buildings and dormitory buildings, such as yoga rooms and strength training rooms so that college students can quickly reach these sports fields, reduce time costs, and improve the utilization rate of the fields. In addition, it is necessary to plan bicycle lanes and walking paths on campus based on the daily exercise needs of college students and to integrate sports facilities with the natural landscape on campus. The improvement and construction of the maintenance and management mechanism for sports facilities aim to ensure that all sports facilities are always in a normal and safe state for use. Regular maintenance, upkeep, and management of various sports facilities can be carried out through the establishment of a sports facility management department.

5.4. Strengthen supervision and incentives to consolidate the habit of exercising

If schools want to encourage college students to develop the good habit of lifelong exercise, they can supervise and motivate college students' exercise by improving the construction of the physical education assessment and evaluation system. If schools want to encourage college students to develop the good habit of lifelong exercise, they can supervise and motivate college students' exercise by improving the construction of the physical education assessment and evaluation system. The autonomy of college students in participating in sports activities, the frequency of exercise, and the duration of exercise, as well as other sports performance, will be the key points of assessment. And the assessment should be implemented through diversified means. Besides the evaluation method of testing, it is also necessary to add self-evaluation and mutual evaluation among college students to ensure that the assessment and evaluation results are objective and comprehensive enough^[10]. At the same time, it is necessary to strengthen the implementation of the reward mechanism and offer both spiritual recognition and material rewards to college students who have performed outstandingly in sports activities. The establishment of sports scholarships can be utilized to stimulate college students' enthusiasm for participating in sports activities. Scholarships are awarded to college students who perform outstandingly in sports tests and have good exercise habits, so as to serve as an incentive for the majority of students and encourage more college students to actively and independently participate in sports activities. In addition, the school can also organize college students to carry out sports competitions within the dormitory, such as dormitory basketball games, badminton games, rope skipping games, etc. Physical education assessment and scoring can be conducted by the dormitory to enhance college students' sense of collective honor and cohesion.

6. Conclusion

In conclusion, there is a close connection between college students' physical health and their exercise habits. Promoting college students to develop good exercise habits plays an important role in continuously improving their physical health. To this end, a series of measures needs to be implemented to imperceptibly cultivate good exercise habits among college students. In the future, technologies such as big data and artificial intelligence should be more actively and deeply integrated into the physical health training of college students, so as to achieve more ideal training results.

Disclosure statement

The author declares no conflict of interest.

References

- [1] Wang L, 2024, Analysis of Exercise Habits and Physical Health of College Students in Regular Colleges and Universities in Ningxia. *Stationery and Science & Technology*, 2024(23): 82–84.
- [2] Zhang ZM, 2024, Research on the Role and Application of Track and Field Sports in Colleges and Universities in Promoting Students' Physical Health. *Stationery & Science & Technology*, 2024(15): 27–29.
- [3] Su JC, Shen YQ, Li C, 2024, Evaluation of the Effect of Taekwondo in Improving the Physical Health of the Nation. *Stationery & Science & Technology*, 2024(5): 145–147.
- [4] Zhu SM, Qiu ZC, Wu D, 2023, Research on Physical Health Intervention for College Students from the Perspective of Sports Psychology. *Boxing and Combat Sports*, 2023(1): 34–36.
- [5] Tang M, Luo CL, Li SL, 2023, The Impact of Popularizing Campus Winter Sports on the Physical Health of Teenagers. *Journal of Harbin Polytechnic College*, 2023(5): 133–135.
- [6] Li DF, Jiang T, Bai TY, et al., 2023, The Influence of High-intensity interval Training and Dietary Nutrition Intervention on the Physical Health of Overweight and Obese College Students. *Occupational and Health*, 39(4): 531–535 + 542.
- [7] Li FH, Yuan Q, 2024, Research on the Correlation between Exercise Load and Physical Health of Adolescents. *All Sports*, 2024(16): 5–6.
- [8] Xie HY, 2025, Analysis of Scientific Training Methods for Improving the Physical Health of Teenagers. *Contemporary Sports Science and Technology*, 15(1): 33–35.
- [9] Xu JW, Jing LJ, Yang SC, 2020, The Value Implications, Practical Predicaments and Relief Paths of Promoting the Physical Health of College Students in the New Era. *Bulletin of Sports Science and Technology Literature*, 33(2): 118–121 + 126.
- [10] Wang QQ, Ouyang X, 2024, Research on Intervention Strategies for Improving Students' Physical Health at Different Stages. *Contemporary Sports Science and Technology*, 14(17): 178–181.

Publisher's note

Bio-Byword Scientific Publishing remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

The Application of Digital Multimodal Resources in Business English Classroom Teaching

Wenmin Chen*

Guangdong Polytechnic of Industry and Commerce, Guangzhou 510510, China

**Author to whom correspondence should be addressed.*

Copyright: © 2025 Author(s). This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0), permitting distribution and reproduction in any medium, provided the original work is cited.

Abstract: With the continuous development of the global economy, companies are increasingly demanding business English professionals. These professionals are not only required to possess fluent English communication skills but also to be familiar with import and export trade processes, international business rules, and cross-cultural contexts. However, current business English teaching in universities primarily relies on the transfer of language knowledge, lacking integration with real-world business scenarios, resulting in graduates' limited employability. The introduction of digital multimodal resources offers a new breakthrough in business English teaching. By leveraging diverse information media such as video, audio, animation, virtual simulations, and interactive platforms, teachers can break through the constraints of classroom time and space and create a more immersive and interactive learning environment. This approach makes abstract business knowledge more intuitive and contextualizes complex communication skills, thereby alleviating the pain points of fragmented knowledge, weak skills, and insufficient learning motivation. This paper aims to explore the application of digital multimodal resources in university business English classrooms, analyze their impact on improving students' language skills, cross-cultural communication abilities, and practical engagement, and provide a feasible reference for optimizing the development of business English talent in universities.

Keywords: Business English; Digital multimodal resources; Classroom teaching; Multimodal teaching method; Professional ability training

Online publication: September 18, 2025

1. Introduction

As the global economy continues to deepen, companies have put forward higher-level requirements for the comprehensive capabilities of business English talents. In particular, small and medium-sized enterprises generally expect graduates to have the comprehensive quality of "ready to work and competent", not only to be able to communicate fluently in English, but also to be familiar with import and export trade processes, international business rules, and multicultural backgrounds. However, at present, business English classes in colleges and universities are mainly based on language knowledge inculcation, which is not practical enough

and out of touch with real business scenarios. This has led to insufficient employment competitiveness of graduates, some companies “cannot recruit suitable talents”, and the mismatch between supply and demand of college graduates, “cannot find matching positions”, has become more and more prominent.

In this context, the introduction of digital multimodal resources provides a new breakthrough for business English teaching in colleges and universities. With the help of various information carriers such as video, audio, animation, virtual simulation, and interactive platforms, teachers can break through the time and space limitations of the classroom and build a more immersive and interactive learning environment, making abstract business knowledge visual and complex communication skills contextualized, thereby alleviating the core teaching pain points of “fragmented knowledge, weakened skills, and insufficient learning motivation.”

This paper aims to explore the application model of digital multimodal resources in business English classes in colleges and universities, analyze its role in improving students’ language skills, cross-cultural communication ability, and sense of practical participation, and provide a feasible reference for colleges and universities to optimize the training path of business English talents.

2. Research background and current issues

With the continuous advancement of the global economic integration process, Business English has gradually evolved from a single language learning to a composite application course that integrates language skills, professional knowledge, and cross-cultural communication skills. With the increasing frequency of international trade activities and the deepening of corporate foreign exchanges and cooperation, the demand for business English talents by enterprises not only stays on the basic listening, speaking, reading, writing, and translation skills, but also pays more attention to their understanding of trade processes, mastery of business rules and practical application of cross-cultural business communication. Especially under the impetus of my country’s “going out” strategy and the “Belt and Road” initiative, the market has put forward higher requirements for composite business English talents with practical skills and cross-cultural adaptability.

However, from the perspective of the current business English teaching model in colleges and universities, there is still a significant disconnect between teaching results and social needs. On the one hand, most college classroom teaching is still based on “textbooks as the outline, teachers as the leader, and knowledge instillation”, ignoring students’ comprehensive application training in real business scenarios, resulting in students having certain language knowledge but being unable to perform actual business work. On the other hand, limited by classroom time and space and traditional teaching methods, teachers often lack sufficient means to build a language practice environment for students that is close to workplace needs, making classroom teaching remain at the level of “knowledge input” and lacking an effective path for “skill output.”

3. Literature review

Existing studies have generally pointed out that business English courses in colleges and universities are out of touch with the actual needs of the industry to varying degrees. Włosowicz’s research shows that even if students have strong learning motivation, the content taught in class is still difficult to fully cover the professional terms, economic concepts, and business writing skills they need in the actual business environment ^[1]. The mastery of business terms by students of different grades varies greatly, and even in the senior grades, there is still a problem of being unskilled in the use of core terms. This shows that a single classroom teaching model

is difficult to effectively meet students' deep needs for professional and practical knowledge, and it is easy to cause students to still face difficulties in adapting to the workplace after completing their studies.

Roshid and Kankaanranta's survey of the international garment industry further verified this problem. They found that although college English courses cover basic communication skills, there is a large gap in meeting the industry's requirements for core skills such as practical business communication skills, application of professional terminology, and clear expression ^[2]. In particular, in high-frequency job skills such as foreign trade negotiations, contract formulation, and business document writing, graduates often lack the ability to directly take up jobs, making it difficult for talents trained by colleges and universities to quickly adapt to corporate employment standards.

Combined with the current research background, it can be seen that if business English classroom teaching continues to remain at the stage of single knowledge transfer, it will not be able to effectively solve the practical problem of students' "disconnection between learning and application."

In recent years, the research on business English courses in colleges and universities has shown significant diversification and innovation, gradually breaking the traditional language classroom model of "teacher-centered and knowledge-oriented" and transforming towards ability-oriented, task-driven, and scenario-simulated directions. From the latest literature, Project-Based Learning (PBL), flipped classroom, Discourse Driven Learning (DDL), and hybrid teaching models have gradually become the focus of research, reflecting that college business English teaching attaches great importance to the cultivation of professional, practical, and communicative abilities.

Hao et al. verified through quasi-experimental research that project-based learning and project-based flipped classrooms significantly promote students' higher-order thinking ability, especially in the cultivation of critical thinking and creativity ^[3]. This study shows that the traditional knowledge-based course model is difficult to stimulate students' deep thinking, and practical-oriented project tasks can better promote the expansion of students' thinking ability. Khamouja further pointed out that PBL can also effectively improve students' communication skills in real contexts in business English classes, helping students overcome the passive learning mode of "learning from paper" and form a positive learning attitude of active participation and language output ^[4].

At the same time, Larbi and Ahmed found through empirical research on Discourse Driven Learning (DDL) that this model not only strengthens the application ability of business English vocabulary but also helps students build stronger language confidence in cross-cultural scenarios ^[5]. Chi's research further confirmed the positive impact of PBL on students' multi-dimensional abilities. It not only improves language ability but also significantly enhances students' teamwork and social skills, helping students to develop more practice-oriented comprehensive language abilities ^[6].

In the field of writing ability training, Sun and Asmawi's research introduced the Presentation-Assimilation-Discussion (PAD) classroom model and confirmed its all-around improvement effect on the quality of business English writing ^[7]. In addition, Hu and Song focused on the role of open digital resources, such as Massive Open Online Course (MOOC), in business English teaching, and proposed that the combination of digital platforms and flipped classrooms can promote the reshaping of teacher and student roles and the improvement of classroom interaction vitality ^[8].

From the perspective of multimodal applications, some studies have reflected the diverse values and challenges of digital multimodal resources in language teaching.

First, the study by Kholis and Azmi emphasized the importance of integrating multimodal materials (such as text, audio, video, and interactive tasks) in the development of e-books, especially in cultivating students' 21st-century skills (communication, collaboration, critical thinking, and creativity) ^[9]. This shows that multimodal resources not only enrich the input form but also enhance students' digital literacy and comprehensive ability cultivation.

Mohamed's research further pointed out that by combining multimodal elements in Project-Based Learning (PJBL), teachers can better adapt to students' language proficiency and learning needs, thereby improving language learning outcomes and critical thinking ^[10]. This reflects the potential of multimodal resources in flexible adjustment of teaching methods and personalized support.

Laksana's empirical research has shown that multimodal e-books significantly improve students' language ability and behavioral performance in business English courses, and students' acceptance and willingness to use multimodal digital resources are also very high ^[11]. This emphasizes the challenge and supplementary role of multimodal resources to traditional ESP teaching models.

The Human-Computer Interaction (HCI) multimodal teaching method proposed by Shu et al. shows that a good classroom atmosphere and teacher-student interaction depend on the effective application of multimodal teaching methods, which promotes the improvement of student participation and classroom efficiency ^[12]. This reflects the important role of multimodal resources in optimizing the teaching environment and promoting teacher-student interaction.

Maktiar Singh and Yoke focused on the combination of visual and verbal modes, especially their application in academic oral expression, showing that multimodal elements (such as PPT slides) are not only auxiliary tools, but also an important part of expression and communication. However, the study also found that despite the popularity of multimodal resources, students still face the challenge of insufficient expression ability, suggesting that multimodal teaching needs to pay more attention to skill training and expression guidance ^[13].

4. Practical application of digital multimodal resources in business English classroom teaching

4.1. Application ideas and practical goals

Based on the analysis of the current teaching dilemma, the introduction of digital multimodal resources is not only an update of technical means, but also a teaching transformation path that responds to the actual needs of the talent market. The goal of business English teaching not only includes the mastery of basic English listening, speaking, reading, and writing skills, but also focuses on cultivating students' ability to use English to complete practical business tasks, covering business negotiations, product introductions, cross-cultural communication, workplace interviews, and other practical links. Therefore, the core application idea of multimodal resources is to break the closed nature of traditional classrooms and build a dynamic, scenario-based, and interactive teaching space, so that students can understand knowledge and acquire skills through multi-sensory participation.

Specifically, the practical application of digital multimodal resources in business English classrooms mainly revolves around three core goals: First, to improve students' language skills, especially their ability to express themselves in real business situations. Second, educators will strengthen students' professional ability training by exposing them to the operational procedures and communication skills in actual business

activities through simulation scenarios and case training. Third, it significantly enhances students' classroom participation, stimulates their interest in learning through multiple means such as audio, video, and virtual reality, and improves the one-way indoctrination of students in traditional classrooms where they passively accept knowledge.

The establishment of these three goals is a response to the current employment market's requirements for the diverse abilities of compound business English talents. It is also an effective return to the "practicality" and "career-oriented" characteristics of business English teaching in colleges and universities.

4.2. Types and functions of digital multimodal resources

In the current business English classroom teaching reform, the application of digital multimodal resources presents rich forms and diverse functions. The core advantage of multimodal resources is that they break through the limitations of single-text and oral teaching. Through multi-sensory participation and multi-channel input, students can gradually master business English skills in a real and dynamic language environment, and comprehensively improve their language literacy and professional application ability. As the most popular multimodal teaching method, audio and video resources play a significant role in supplementing teaching. The application of visual PPT and chart resources effectively improves the visibility of classroom content and the depth of understanding of professional knowledge. The introduction of interactive platform tools has greatly increased the frequency of classroom interaction and students' enthusiasm for participation. The application of virtual simulation and augmented reality (AR) technology has broadened the classroom boundaries for business English teaching and created a more immersive and practice-oriented learning experience.

4.3. Multimodal integration practice in typical business English teaching links

Multimodal teaching not only optimizes the overall classroom process but also accurately corresponds to the needs of professional scenarios in specific business English modules. Designing multimodal resources and activities for different modules helps to break through the limitations of traditional teaching and improve students' practical language skills and comprehensive business literacy.

4.3.1. Business negotiation module

Teachers help students understand language expression and strategy application by introducing audio and video of business negotiations, combined with flowcharts and term lists. In group simulation negotiations, students interact in different roles, use the platform to record and provide feedback, and complete the learning cycle of "input-practice-feedback."

4.3.2. Product promotion module

With the help of corporate press conference videos, PPT, and chart presentations, students learn product description language and industry terminology. Group exercises are combined with recording and commentary to train expression, logic, and product presentation skills, and improve practical application capabilities in the workplace.

4.3.3. Job interview module

Through recruitment videos, interview records, and virtual simulation technology, students practice interview

language in real situations. Combined with PPT presentation strategies and individual feedback, students complete simulated interview training to improve their expression standards and adaptability.

5. Conclusion

The introduction of digital multimodal resources provides innovative solutions for business English classroom teaching, especially in improving students' language skills, cross-cultural communication skills, and sense of practical participation. Through multi-sensory participation and multi-channel information input, students can not only better master the basic knowledge of business English, but also improve their application ability in simulated actual business scenarios. Multimodal teaching methods break the limitations of traditional teaching models, enhance students' classroom participation and practical operation ability, and help them better adapt to various complex language and communication needs in the workplace.

In the future, with the further development of digital technology, the application of multimodal teaching resources will be further deepened, bringing more innovative possibilities to business English teaching. Colleges and universities should strengthen the integration and application of multimodal resources, explore teaching models that are more in line with industry needs, and thus provide strong support for the cultivation of compound business English talents with cross-cultural adaptability and practical operation ability.

Disclosure statement

The author declares no conflict of interest.

References

- [1] Włosowicz TM, 2023, The Relationship between Students' Motivation for Studying Business English and Their Knowledge of Business English and Its Terminology. *Theory and Practice of Second Language Acquisition*, 2(9): 1–26.
- [2] Roshid MM, Kankaanranta A, 2025, English Communication Skills in International Business: Industry Expectations Versus University Preparation. *Business and Professional Communication Quarterly*, 88(1): 100–125.
- [3] Hao L, Tian K, Mohd Salleh UK, et al., 2024, The Effect of Project-based Learning and Project-based Flipped Classroom on Critical Thinking and Creativity for Business English Course at Higher Vocational Colleges. *Malaysian Journal of Learning and Instruction (MJLI)*, 21(1): 159–190.
- [4] Khamouja A, 2024, Developing Business English Learners' Communication Skills through Project-Based Learning Method. *Frontiers in English Language and Linguistics*, 1(1): 13–21.
- [5] Larbi Q, Ahmed MB, 2025, Exploring the Efficacy of the Discourse-Based Approach on Teaching Business English in Algeria: A Needs Analysis Perspective with Master1 Students at Tlemcen University. *Indonesian Journal of Social Science Research*, 6(1): 54–66.
- [6] Chi DN, 2023, Benefits of Implementing Project-based Learning in an English for Business Course. *Journal of Ethnic and Cultural Studies*, 10(3): 55–71.
- [7] Sun L, Asmawi A, 2023, The Effect of Presentation-assimilation-discussion (PAD) Class Model on Chinese Undergraduates' Business English Writing Performance. *Journal of Language Teaching and Research*, 14(1): 57–69.

- [8] Hu L, Song C, 2024, Research and Practice of Flipped Classroom Teaching Mode of Integrated Business English Course Under MOOC Environment. *Sino-US English Teaching*, 21(9): 411–418.
- [9] Kholis A, Azmi U, 2023, A Need Analysis on Developing English Interactive Multimodal E-book Oriented to 21st Century Skills. *Elsya: Journal of English Language Studies*, 5(1): 85–106.
- [10] Mohamed AM, 2023, Investigating the Benefits of Multimodal Project-based Learning in Teaching English to International Students. *International Journal of Educational Innovation and Research*, 2(2): 114–129.
- [11] Laksana IPY, Padmadewi NN, Suarcaya P, et al., 2024, Evaluating a Multimodal Digital Book's Impact on ESP Students' Learning Outcomes. *Journal of English Language Teaching Innovations and Materials (Jeltim)*, 6(2): 202–228.
- [12] Shu D, Huang C, Xing Y, 2024, Analysis on the Promotion of Classroom Atmosphere in Multimodal English Teaching Based on Human-Computer Interaction. *International Journal of Human-Computer Interaction*, 40(13): 3516–3527.
- [13] Maktiar Singh KK, Yoke ICL, Ranjethamoney Vijayarajoo A, 2024, Multimodality in Academic Oral Presentations in the English Language and Discipline-based Courses. *Asian Journal of University Education (AJUE)*, 20(3): 663–687.

Publisher's note

Bio-Byword Scientific Publishing remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Research on the Teaching Reform of Medical and Pharmaceutical Majors in Higher Vocational Colleges under the Background of Artificial Intelligence

Xianlin Yuan*

College of Life and Health Sciences, Guangdong Industry Polytechnic University, Guangzhou 510270, Guangdong, China

**Author to whom correspondence should be addressed.*

Copyright: © 2025 Author(s). This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0), permitting distribution and reproduction in any medium, provided the original work is cited.

Abstract: With the continuous development of information technology, society has now entered the intelligent era, and artificial intelligence (AI) technology has gradually become a new and valued teaching method in the field of education with the progress of the times. Currently, the teaching of medical and pharmaceutical majors in higher vocational colleges needs to conform to the trend of the times, actively integrate AI technology into the teaching process to continuously improve students' learning efficiency, and at the same time provide a new development direction for the existing teaching system, thereby promoting the overall improvement of teaching quality in medical and pharmaceutical majors of higher vocational colleges. Starting from the necessity of integrating AI into the classroom teaching of medical majors in colleges and universities, this paper deeply explores the effective paths for teaching reform of medical and pharmaceutical major courses in higher vocational colleges under the background of AI, and puts forward the key points of AI-enabled innovation in teaching models and methods. It is hoped that this study can provide new ideas for front-line teachers to adjust the future medical professional teaching classrooms, and thus continuously promote the innovation and development of the overall teaching of these majors.

Keywords: Artificial intelligence; Medical and pharmaceutical majors; Teaching reform; Teaching evaluation

Online publication: September 18, 2025

1. Introduction

Under the global wave of digital technology revolution, AI technology is reshaping the ecological landscape of the medical and health industry with unprecedented depth and breadth. From intelligent screening in drug research and development, precise decision-making in clinical medication, to intelligent management of medical

services, AI technology has fully penetrated into the core links of the medical and pharmaceutical industry. At the same time, in the process of comprehensive reform in the current education field, modern intelligent technology has become a crucial driving force for promoting the overall development of teaching. Therefore, in the current teaching of medical majors in higher vocational colleges, the traditional teaching methods can no longer meet the increasingly diverse learning needs of students, which, to a certain extent, indicates the lag of traditional teaching methods. The application of AI technology in teaching can effectively enhance students' ability to transform knowledge during the learning process; moreover, more innovative teaching and practical methods can help them further improve the ability to apply the knowledge they have learned in practical work, thereby promoting the overall progress of students in learning. Therefore, to better align the cultivation of medical and pharmaceutical major students in higher vocational colleges with future job positions, it is necessary to introduce AI technology in a timely manner.

2. The necessity of integrating artificial intelligence into the classroom teaching of medical and pharmaceutical majors in colleges and universities

2.1. Helping teachers improve teaching efficiency

For higher vocational colleges, the efficiency and quality of teaching are important criteria to ensure that professional classroom teaching maintains a high level. Therefore, integrating artificial intelligence (AI) technology into the teaching of medical and pharmaceutical majors in higher vocational colleges is a key link in enhancing the overall effectiveness of teaching. For teachers, the application of AI technology can help them complete some pre-class preparation work that is highly mechanical and repetitive, while also assisting in the development of creative teaching activities in the classroom^[1]. With the support of modern information technology, AI can also provide more intelligent teaching auxiliary tools for the entire teaching process, such as intelligent lesson preparation systems and online learning platforms, helping teachers quickly integrate relevant documents and teaching materials^[2]. For example, when preparing courses related to pathology, teachers can use intelligent systems to automatically search for the latest medical achievements or typical cases, which greatly improves their lesson preparation efficiency, saves lesson preparation time, and allows them to devote more energy to subsequent teaching design, thereby enhancing the corresponding teaching efficiency.

2.2. Enhancing students' personalized learning experience

The classroom teaching in most higher vocational colleges is mainly dominated by teachers' lectures on theoretical knowledge, and students are generally in a standardized and stereotyped state of passive reception. This state has a certain impact on the improvement of their learning innovation, and thinking abilities. Moreover, against the background of an increasingly information-based era, students' learning needs have become more diversified, and they are more in need of teaching arrangements that support their personalized learning^[3]. AI technology can intelligently analyze students' in-class learning behaviors, current interests and hobbies, and overall cognitive levels. Based on the different needs and characteristics of each student, it formulates personalized learning plans and provides customized learning resources. This ensures that students can more independently choose learning content and methods, and better cultivate their autonomous learning and innovative abilities^[4].

2.3. Effectively improving the evaluation mechanism

At present, the teaching evaluation method for medical majors in higher vocational colleges still adopts the traditional approach of using grades to assess students' learning effects at a certain stage. Although this evaluation method can reflect students' learning status to a certain extent, it cannot fully show the progress students have made throughout the learning process. The integration of AI technology can make up for this deficiency. Big data and intelligent tracking systems can effectively record all aspects of students' learning processes, both in and out of class, including their progress and setbacks in specific areas. At the same time, combined with intelligent assessment technology and feedback mechanisms, it can provide teachers with a more comprehensive and objective evaluation result of students^[5]. Through these results, teachers can not only obtain students' exam scores but also analyze their participation in the learning process and the improvement of various abilities. The changes at a certain stage can directly reflect the effectiveness of the teaching methods used by teachers, thereby helping teachers adjust subsequent teaching strategies in a timely manner and maximize the scientificity of teaching decisions^[6].

3. Effective paths for the teaching reform of higher vocational medical courses in the context of artificial intelligence

3.1. Reconstruct the curriculum system and integrate artificial intelligence technology

In the current era, with the improvement of various medical equipment and the emergence of new diseases, the pharmaceutical industry's requirements for professionals in related fields are constantly increasing. However, most curriculum systems of higher vocational medical majors are centered on basic medical theories and clinical practical skills. Although this basic knowledge can help students improve their abilities to a certain extent, it cannot fully meet the industry's demand for interdisciplinary talents^[7]. Therefore, in the teaching process, medical professional teachers need to break the limitations of the original curriculum, reconstruct the teaching system, integrate the latest existing medical achievements with contemporary artificial intelligence technology, and continuously expand the knowledge horizon of students. Specifically, teachers can specifically add courses related to artificial intelligence and medicine to the teaching system, such as the course "Introduction to Medical Artificial Intelligence." This course can systematically introduce to students the application scenarios and specific operation methods of artificial intelligence in various fields such as disease prediction, drug research and development, and medical image diagnosis, enabling them to have a certain understanding of relevant knowledge directions. At the same time, supporting courses such as "Big Data and Medical Information Processing" and "Introduction to Deepseek and Its Applications" can be set up to help students master certain data collection and analysis methods, so that they can use big data technology to explore potential medical laws in the future, thereby providing data support for subsequent disease diagnosis and treatment as well as drug research and development^[8]. In addition to adding new courses, teachers can also optimize the content of existing courses. For example, when explaining the content of pathology-related courses, teachers can use artificial intelligence technology for intelligent image recognition to help students quickly identify the characteristics of pathological sections, thereby improving the accuracy of their diagnosis and promoting the integration of the knowledge they have learned with practice. This method can effectively optimize students' ability to absorb and transform the knowledge they have learned, thereby improving their overall learning quality.

3.2. Innovate teaching modes and enhance students' comprehensive abilities

Against the backdrop of the continuous rise of artificial intelligence, although the traditional teaching mode can help teachers achieve the corresponding teaching goals, for a relatively boring major like medicine and pharmacy, the teacher-centered teaching mode in traditional classrooms can hardly stimulate students' interest in learning anymore, and their innovative abilities will also be affected under the repeated teaching mode. Therefore, the most important task for higher vocational medical professional teachers is to be willing to use artificial intelligence technology to innovate teaching modes, give full play to the advantages of modern technology, and continuously enhance the attractiveness of teaching classrooms ^[9]. In the process of classroom teaching, teachers can use artificial intelligence learning analysis technology to record students' complete learning behaviors, including course participation, homework completion, and exercise accuracy, and generate personalized learning plans for each student. The learning plans are continuously adjusted according to the learning effect of each stage to form dynamic teaching guidance, thereby realizing precision teaching and laying a solid foundation for students to improve their innovative abilities in the future. In addition, teachers can also introduce project-based teaching, allowing students to conduct in-depth analysis and practice through actual medical cases, thereby continuously enhancing their practical abilities and innovative awareness ^[10]. For example, teachers can use actual intelligent medical projects as guidance, and let students use relevant technologies to develop simple disease prediction models or design intelligent health monitoring systems for a specific disease. After assigning the corresponding project tasks, teachers can organize students into corresponding project teams. Teachers can demonstrate various processes from project demand analysis to scheme design for each project team, so that students will not deviate from the main direction during the self-design process. The final technology implementation and result presentation are also very important links. Teachers need to give full play to their role as guides, provide certain professional guidance in these two links, and generate special project completion reports for students combined with artificial intelligence technology, enabling them to recognize their own strengths and weaknesses. During the project implementation process, students can not only integrate the medical knowledge and artificial intelligence technology they have learned in class, but also deeply understand the importance of integrating knowledge and technical practice in actual work. At the same time, they can also imperceptibly exercise their collaboration skills, communication skills, and problem-solving abilities ^[11]. In the teaching process, teachers can also consciously encourage students to participate in various discipline competitions and innovation and entrepreneurship projects related to intelligent medical care. Such competitions and activities, which are more closely connected with society, can help students fully improve their comprehensive abilities, including the ability to apply new technologies, knowledge transformation ability, and innovative ability. These abilities can effectively help them solve various problems encountered in their future work, thereby continuously improving students' internal competitiveness in the era of artificial intelligence.

3.3. Building online platforms to promote personalized teaching

The successful construction of online teaching platforms is also inseparable from the support of artificial intelligence (AI) technology. Through big data analysis systems, teachers can real-time track students' learning progress and actual learning status. With the assistance of this technology, they can identify students' learning difficulties, adjust subsequent teaching methods and tutoring strategies, and at the same time provide stronger support for the personalized development of medical professional teaching in higher vocational colleges ^[12].

Students can complete medical and pharmaceutical knowledge consolidation and practical exercises, matching teaching materials on the online teaching platform. The teaching system then conducts an in-depth analysis of students' exercise results using intelligent algorithms and machine learning algorithms, and generates personalized learning reports. These reports cover aspects such as students' weak areas, the degree of knowledge mastery, and learning habits. Such reports not only help teachers analyze the effectiveness of their own teaching methods but also provide strong guidance for subsequent teaching. After students complete the exercises, teachers can also selectively push practical case exercises through the teaching platform—focusing on the same theme, covering similar types of knowledge tests, or involving technical application. Combined with simple virtual technology, these exercises help enhance students' practical operation capabilities. Meanwhile, students can independently choose the skills and solutions to apply during the process, which improves the personalization of their practice. In addition, the online teaching platform can be equipped with built-in medical application cases of various natures and basic inspection and tracking functions for students. This provides students with more extended practice opportunities, ensuring the effectiveness and timeliness of professional teaching. Through this approach, each student can adapt to different AI technologies at a pace suitable for themselves. Moreover, this personalized learning method enables them to steadily improve their autonomous learning abilities, ultimately achieving an all-around enhancement of comprehensive quality.

4. Research on AI-driven innovation in teaching models and methods

4.1. Establishing an intelligent practical training system integrating virtual and physical elements

Against the backdrop of AI, virtual simulation technology can be further introduced in the process of teaching reform for medical majors. By simulating real work scenarios, this technology helps break through the bottlenecks of traditional practical training. For example, some colleges and universities build relevant virtual simulation research laboratories based on the existing National Center for Drug Safety Evaluation, providing students with venues to truly familiarize themselves with clinical drug experiments. Through this approach, students can also gain a preliminary understanding of real work processes and continuously improve their ability to solve practical problems through repeated practice^[13].

4.2. Personalized learning and intelligent evaluation systems

The AI-based “adaptive learning system” is completely changing the “one-size-fits-all” model of traditional medical education. The Guidelines for the Application of Artificial Intelligence in Vocational Colleges issued by the Ministry of Education clearly put forward requirements for “personalized learning and skill training” and advocate the use of intelligent learning support platforms, learning situation analysis systems, and other tools to support students' personalized learning^[14]. Under the background of the Ministry of Education's “Golden Course” construction initiative, the online courses offered by many schools have introduced the “AI teaching assistant personalized customization” system. This system can assign an assistant robot to each course, using AI technology to provide students with supportive learning services such as real-time Q&A, learning guidance, resource recommendation, and learning reminders^[15].

4.3. Multi-dimensional literacy evaluation model

Against the backdrop of artificial intelligence (AI), the evaluation of medical and pharmaceutical talents needs

to go beyond the traditional knowledge assessment model and establish a multi-dimensional literacy evaluation system. The Informatization Teaching Guidance Committee for Vocational Colleges under the Ministry of Education released the Guidelines for the Application of Artificial Intelligence in Vocational Colleges, which requires vocational colleges to “join hands with industry enterprises, professional guidance committees, and other parties in collaborative cooperation to jointly promote the all-round improvement of students’ AI literacy and professional capabilities.” For instance, a certain medical university has developed a “dual-alignment, five-dimensional, and diversified” evaluation model to conduct a unified assessment of students’ abilities in five dimensions: professional competence, experimental skills, comprehensive pharmaceutical thinking, innovative ability, and innovative practice. Corresponding learning pathways and guidance are also provided based on the evaluation results. Meanwhile, by leveraging advanced science and technology, it is also possible to develop evaluation tools of different levels through AI literacy evaluation systems, such as dynamic competency mapping, thereby realizing the visualized evaluation of students’ literacy^[16].

5. Conclusion

In summary, with the development of the new era, AI technology has been deeply integrated into the field of education. As a discipline closely linked to various emerging medical and pharmaceutical technologies, the teaching of medical and pharmaceutical majors in higher vocational colleges must keep pace with the changing trends of the times and continuously enhance the application of AI technology in the teaching process. Professional teachers need to constantly adjust their teaching methods and content to optimize the overall teaching process, ensuring that students’ learning aligns with the current pace of social development and maximizing the forward-looking nature of medical and pharmaceutical professional classrooms.

Funding

Research on Innovative Reform of Pharmacology Course Teaching in Higher Vocational Pharmaceutical Majors Based on OBE Concept and Knowledge Graph Integration (No. 2024MU004), Ministry of Education, Higher Education Scientific Research and Development Center, China University Research Innovation Fund

Disclosure statement

The author declares no conflict of interest.

References

- [1] Du W, Liu KW, 2025, Research on the Implementation Path of Artificial Intelligence Empowering the Reform of College Classroom Teaching. *Journal of International Trade*, 2025(6): 144–147. <https://doi.org/10.20216/j.cnki.fert1987.2025.06.031>
- [2] Song J, Deng W, 2024, Exploration and Practice of Diagnosis and Improvement in Higher Vocational Classroom Teaching under the Background of Big Data. *Modern Vocational Education*, 2024(35): 101–104.
- [3] Liu X, 2024, Research and Practice on Intelligent Technology Empowering Higher Vocational Classroom Teaching Evaluation. *Journal of Higher Education Research*, 10(35): 106–109. <https://doi.org/10.19980/j.CN23->

- [4] Zhang YY, Chai YF, 2024, Teaching Strategies for Cultivating Professional Literacy of Medical Major Students. *Modern Vocational Education*, 2024(14): 177–180.
- [5] Tang GQ, Chen GB, Chen SH, et al., 2024, Research on Ideological and Political Education in Analytical Chemistry Courses Based on Higher Vocational Medical Majors. *Chemical Enterprise Management*, 2024(10): 37–41. <https://doi.org/10.19900/j.cnki.ISSN1008-4800.2024.10.010>
- [6] Qin JM, Zhang YZ, 2023, Exploration of Artificial Intelligence Empowering in-depth Teaching in Higher Vocational Classrooms. *Modern Vocational Education*, 2023(35): 17–20.
- [7] Wang JH, Chen YY, 2023, Exploration on the Reform of Ideological and Political Teaching in the Course of Higher Vocational Medical Commodity Science Based on the Concept of Moral Education. *Health Vocational Education*, 41(20): 49–51. <https://doi.org/10.20037/j.issn.1671-1246.2023.20.17>
- [8] Xu KS, 2022, Construction and Reform of Biochemistry Course Teaching for Higher Vocational Medical Majors Based on the Creation of Multiple Teaching Scenarios. *Health Vocational Education*, 40(2): 37–39.
- [9] Niu J, Li Q, 2020, Analysis on the Reform of Higher Vocational Classroom Teaching Structure from the Perspective of Artificial Intelligence. *Journal of Changzhou College of Information Technology*, 19(5): 44–46.
- [10] Xie YP, Xu YZ, 2024, Mechanism and Promotion Path of Artificial Intelligence Empowering College Classroom Teaching Reform. *Journal of Neijiang Normal University*, 39(3): 75–78. <https://doi.org/10.13603/j.cnki.51-1621/z.2024.03.013>
- [11] Liu MY, An JQ, Sun LK, et al., 2025, Intelligent Transformation of Multimodal Teaching: Current Situation, Challenges and Future Trends. *China Medical Education Technology*, published online, 1–8. <http://kns.cnki.net/kcms/detail/61.1317.G4.20250617.1553.005.html>
- [12] Che LL, 2025, Artificial Intelligence Drives Ideological and Political Education to Build an Intelligent Teaching Model. *China Reform Daily*, 4.
- [13] Yan C, Zhang Q, Li L, et al., 2025, Reform and Practice of Curriculum Teaching Integrating Artificial Intelligence Technology to Empower Work Scenarios—Taking Pharmaceutical Application Technology as an Example. *Journal of Lanzhou Petrochemical College of Vocational Technology*, 25(2): 80–84.
- [14] Jiang ZY, Xi DM, 2025, Integration of Artificial Intelligence into Postgraduate Education of Biology and Medicine Majors: Opportunities, Challenges, and Countermeasures. *Science & Education Guide*, 2025(6): 5–7. <https://doi.org/10.16400/j.cnki.kjdk.2025.06.002>
- [15] Peng JL, Qin LF, Fang ZD, et al., 2025, Research on the Construction of Curriculum System for Higher Vocational Artificial Intelligence Majors under the Digital Background. *Computer Knowledge and Technology*, 21(6): 24–26. <https://doi.org/10.14004/j.cnki.ckt.2025.0267>
- [16] Zhang YY, Chai YF, 2024, Teaching Strategies for Cultivating Professional Literacy of Medical Major Students. *Modern Vocational Education*, 2024(14): 177–180.

Publisher's note

Bio-Byword Scientific Publishing remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Exploration and Practice of Integrated Teaching Combining “Composition Design and PS Tools”

Xiongwen Gan¹, Wenjing Li²

¹Chongqing Institute of Engineering, Chongqing 400056, China

²Chongqing Metropolitan College of Science and Technology, Chongqing 402167, China

Copyright: © 2025 Author(s). This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0), permitting distribution and reproduction in any medium, provided the original work is cited.

Abstract: With the gradually expanding influence of digital technology in the field of art and design education, traditional composition design courses should also gradually integrate digital technology to achieve integrated development. This paper analyzes the limitations of traditional composition teaching and the central role of Photoshop (PS) in digital design. Based on this, it constructs an integrated teaching model with project-based learning as the core, aiming to explore and practice the deep integration of composition design theory and Photoshop (PS) tools. Practical verification shows that this model significantly improves students’ understanding of composition principles, PS application skills, digital visual expression abilities, and innovative thinking.

Keywords: Composition design; Photoshop; Integrated teaching; Teaching innovation; Practical exploration

Online publication: September 18, 2025

1. Theoretical basis

1.1. Overview of composition design theory

Composition design is a fundamental subject in artistic design that explores the organizational principles of visual elements in two-dimensional or three-dimensional space. Its aim is to cultivate students’ cognition and creativity in formal aesthetics. The core lies in utilizing visual elements such as points, lines, planes, volumes, colors, textures, and spaces, combined with compositional principles like repetition and variation, balance and symmetry, rhythm and meter, contrast and unity, density and distribution, to create visually aesthetic and functional forms. Points are the smallest visual units; lines are the trajectories of points, possessing directionality; planes are the trajectories of lines, possessing shape and volume; volumes are the superposition of planes, forming three-dimensional entities. These elements are interrelated and transformable^[1].

Composition design is mainly divided into three categories: plane composition (two-dimensional visual organization), color composition (color attributes and emotional expression), and three-dimensional composition (spatial relationships of three-dimensional forms). The abstract and universal principles of composition serve as the foundation for artistic design creation, and they are also important pathways for cultivating designers’

critical thinking, sense of form, and innovation ability ^[2].

1.2. Characteristic analysis of digital design tool (Photoshop)

Photoshop (PS), as a powerful bitmap processing software, is an indispensable tool for digital design. Its core characteristics endow it with unique advantages in realizing and expanding composition design ideas: 1. Pixel-level precise control: PS operates based on pixels, enabling precise control of compositional elements, which is crucial for rigorous compositional relationships. 2. Layer system: Each compositional element is independent within its own layer, facilitating free arrangement, combination, deformation, overlay, and attribute adjustment. This enhances the efficiency and modifiability of compositional experiments. 3. Non-destructive editing: Features such as smart objects, adjustment layers, and masks ensure that editing does not damage the original data, facilitating repeated attempts and iterative optimization during exploration. 4. Rich tools and filters: Tools like brushes, selection tools, shape tools, gradients, filters, and layer styles help quickly generate compositional elements, simulate materials, and achieve complex visual effects. 5. Color management and expressiveness: A comprehensive color management system provides precise control over colors, assisting students in intuitively exploring color relationships and emotional expressions. 6. Visualization and real-time feedback: An intuitive interface and real-time feedback enable students to quickly validate ideas, make timely adjustments and optimizations, and form a positive interactive learning cycle ^[3].

PS is not just a drawing tool, but also a powerful visual experimentation platform that transforms abstract compositional theories into operable digital languages, providing infinite possibilities for the practice of compositional principles and cultivating students' digital design thinking for the future.

1.3. Relevant theories of integrated teaching

The integrated teaching model of “compositional design + PS tools” requires educational theoretical support, mainly involving constructivist learning theory, project-based learning (PBL) theory, and technology-assisted teaching theory.

Constructivist learning theory: Learners actively construct understanding through interaction with the environment and accumulation of experience. In integrated teaching, students manipulate compositional elements in PS, actively explore compositional representations in a digital environment, and build experience with the synergistic effects of compositional principles and digital tools by attempting to solve problems, which they then share and interact with their group ^[4].

Project-based learning (PBL) theory: This theory is oriented towards real or simulated complex problems, where students acquire knowledge and skills through the completion of comprehensive projects. It fosters abilities such as problem-solving, critical thinking, and collaboration. In integrated teaching, incorporating design and Photoshop (PS) operations into practical projects promotes the enhancement of students' comprehensive abilities and the deep integration of knowledge ^[5].

Technology-assisted instruction theory: This theory utilizes information technology to optimize the teaching process and enhance teaching effectiveness. In integrated teaching, PS tools provide visualization, interactivity, efficiency, and reproducibility, expanding learning boundaries and stimulating innovation.

Together, these theories provide a framework for integrated teaching, emphasizing a student-centered approach where knowledge is constructed and abilities are cultivated through practice and technological support.

2. Analysis of the current situation and integration pain points in design teaching

2.1. Limitations of traditional design teaching

The traditional design teaching model faces multiple limitations in the digital era: 1. Disconnect from industry practices: There is an excessive reliance on manual operations like hand-drawing and cutting-and-pasting, creating a significant gap with the digital workflows commonly used in the modern design industry. This leads to a disconnection between learning and practical application. 2. Inadequate integration of theory and practice: The teaching of design principles tends to be theoretically abstract, making it difficult for students to apply them to digital creations. This results in a “mere theoretical discussion” phenomenon. 3. Monotonous teaching methods and low interest in learning: Traditional classroom lectures and assignments are often boring, lacking interaction and fun, which limits students’ enthusiasm. 4. Restricted development of innovative thinking: The high cost of modifications in manual operations discourages students from making bold attempts and iterative optimizations, thus inhibiting the development of innovative thinking.

2.2. Inadequate application of PS tools in current teaching

Despite Photoshop’s dominance in the design field, its application in the teaching of compositional design in many universities remains inadequate. Most institutions offer PS skills as a separate course, lacking organic connections with basic theoretical courses such as compositional design. The operation of PS stays at a basic level, lacking deep integration. Even when PS applications are involved, they are limited to simple processing or layout, and are not used as a visualization and practical platform for compositional principles. There is a lack of systematic, integrated teaching design in coursework, and courses do not include projects that combine compositional theory with PS operations. Teachers demonstrate functions in a fragmented manner, making it difficult for students to establish a complete understanding of “theory-tool-practice-effect.” Finally, the widespread lack of integration of teaching concepts and practices among teachers, as well as insufficient understanding or experience in the deep application of PS and its integration into compositional teaching, results in students having a weak understanding of PS application.

2.3. Challenges faced by integrated teaching

Although integrated teaching has significant advantages, it still faces challenges in practice: 1. Cross-domain requirements for teachers’ knowledge and skills: Teachers need to be proficient in compositional theory and PS operations and application skills, facing significant transformation pressure. 2. Curriculum system and teaching resource adjustment: Comprehensive adjustments are needed in the course syllabus, content, assignment formats, and evaluation systems, as well as the development of related teaching resources, which involves a large workload. 3. Student foundation differences and adaptability: Students have varying levels of computer and PS knowledge, and introductory learning may take up too much time, requiring guidance. 4. Software and hardware facility support: Well-equipped computer classrooms, sufficient software licenses, and a stable network environment are needed. 5. Evaluation mechanism establishment: A scientific, objective, and comprehensive evaluation system needs to be designed, taking into account compositional principles, PS skills, and the innovation of works. Based on the above challenges, facing and actively responding to them is the key to successfully implementing the integrated teaching mode of “compositional design + PS tools.”

3. Construction of an integrated teaching model combining “Composition design + PS tools”

Based on the analysis of the limitations of traditional teaching and the pain points of integration, this study constructs a teaching model with deep integration of “Composition design + PS tools” as the core, aiming to achieve an organic unity of theory and practice.

3.1. Setting course objectives

The course objectives of the integrated teaching model cover the cultivation of formal aesthetic sensibility and the application ability of digital tools, specifically as follows:

Knowledge objective: Master the elements and principles of composition, and understand the technical logic of PS implementation.

Ability objectives: 1) PS tool application: Proficiently master the core operations of PS and apply them to composition creation. 2) Compositional thinking and digital expression: Able to convert abstract composition principles into PS operations for efficient and flexible visual expression. 3) Innovation ability: Utilize PS features to conduct compositional experiments and cultivate innovative design thinking in a digital environment. 4) Problem-solving ability: Comprehensively apply compositional knowledge and PS skills to solve visual and technical problems.

Quality objectives: Cultivate students’ perception and appreciation of formal beauty, stimulate interest and enthusiasm in digital design, and foster habits of independent thinking, active learning, and team collaboration.

3.2. Reconstruction of course content and design of integration points

The reconstruction of course content is the core of the integration model, where composition design theory and PS operations are deeply bound, transforming into a synchronous and spiraling structure of “Theory-Tool-Practice.”

Close integration of theoretical knowledge and Photoshop (PS) practice: Point composition: In PS, create and arrange points through brushes, shapes, pattern fills, and filters, observing the effects in real-time. Line composition: Utilize the pen tool, brushes, and shape tools in PS to achieve line compositions with different dynamics and emotions, exploring overlay and lighting effects. Surface composition: Use selection tools, shapes, fills, masks, and blending modes in PS to create, overlay, and combine surfaces, forming spatial relationships.

Color composition: Experiment with color in PS using adjustment layers, gradients, color pickers, and blending modes, experiencing visual impact and emotional expression.

PS application of compositional principles: Design practical PS projects for repetition and variation, balance and symmetry, rhythm and cadence, contrast and unity, utilizing features like transformations, filters, and alignments.

Unit project design: Use projects as a vehicle to integrate compositional elements, principles, and PS operations, simulating the actual design process. For example, creating a “City Impression” poster with point, line, and surface composition, or an “Emotional Color” themed illustration.

Case introduction and analysis: Before each knowledge point or project, introduce excellent digital design cases, analyze their compositional principles, and PS implementation paths to stimulate students’ interest.

3.3. Teaching methods and strategies

Integrated teaching adopts diversified teaching methods to promote active learning and deep participation from students:

Combination of lecturing and real-time demonstration: Deliver precise theoretical explanations while the teacher demonstrates PS operations in real-time, turning abstract principles into concrete examples to improve learning efficiency.

Workshop-style practice: The classroom focuses on hands-on practice by students, with teachers providing guidance, immediate feedback, and personalized instruction.

Project-based learning (PBL): A core methodology where learning in each stage revolves around projects, with students participating throughout the process to stimulate their intrinsic drive for learning.

Flipped classroom and online resources: Basic PS operations and theoretical knowledge are videotaped for self-study before class, while class time is dedicated to advanced practices and problem-solving.

Group collaboration and peer review: Encouraging group projects to foster collaboration and enhance critical thinking and communication skills through peer reviews.

4. Teaching practice and case analysis

In this study, the integrated teaching model of “Composition Design + PS Tools” was applied to the “Composition Design” course for a certain year of art design students at our university. Taking the “Emotional Composition Poster Design” project as an example, the teaching process and student works are detailed below.

4.1. Teaching practice participants and course background

Practice participants: 30 students in the second year of the undergraduate visual communication design major. Students have a basic understanding of traditional painting and color, but their PS skills are relatively weak.

Course background: “Composition design” is a professional foundation course with a total of 48 class hours, 4 hours per week, focusing on the digital expression of plane composition and color composition.

4.2. Implementation of integrated teaching process: Taking the “Emotional composition poster design” project as an example

The project aims to enable students to express specific emotions through PS, using constituent elements such as points, lines, planes, and colors, as well as principles of composition.

4.3. Project background and task setting

Background: Emotional expression is crucial in visual communication, and the ability to convey emotions through abstract visual elements is an essential skill for designers. Task: Select an emotion and design an abstract poster with strong emotional appeal using points, lines, planes, colors, and Photoshop tools. The poster should have a clean and simple design, clear compositional relationships, and appropriate color usage.

4.4. Teaching process

4.4.1. Phase 1: Theoretical introduction and photoshop basics review (4 hours)

Theoretical explanation: Review the principles of graphic and color composition, focusing on explaining the symbolic meaning of compositional elements in expressing emotions.

Case analysis: Showcase excellent abstract emotional posters, analyze their composition, and explore the possibilities of achieving similar designs using Photoshop.

Photoshop basics review and reinforcement: Based on the project requirements, reinforce core operations such as layer management, selection, shapes, filling, transformation, layer styles, blending modes, and color adjustment.

Classroom practice: Assign simple exercises related to Photoshop operations to ensure mastery of the tools.

4.4.2. Phase 2: Sketch conception and photoshop composition experimentation (8 hours)

Emotional association and sketch conception: Students select an emotion and quickly sketch ideas using hand drawing or Photoshop to determine the composition and element forms.

Photoshop composition experimentation: Guide students to experiment with point, line, and plane constructions in Photoshop based on their sketches, applying compositional principles such as repetition and variation, contrast and unity, rhythm and meter. Teachers will circulate and provide guidance, encouraging bold experimentation.

4.4.3. Phase 3: Poster Refinement and Completion (4 class hours)

Detail adjustment and optimization: Students adjust poster details based on feedback (element positioning, colors, layer effects).

Visual effect enhancement: Utilize PS masks, mixing modes, filters, etc., to enhance visual hierarchy and texture.

Self-assessment and improvement: Students conduct self-assessments based on requirements and refine their work.

4.4.4. Phase 4: Result presentation and peer evaluation (4 class hours)

Work presentation: Students take turns presenting their posters, elaborating on design concepts, emotional expression, and the application of compositional principles.

Peer review: Other students provide feedback on aesthetics, emotion, and PS skills.

Teacher summary: The teacher systematically reviews the works, highlighting strengths and weaknesses, and emphasizing common issues.

4.5. Analysis of student works

The “Emotional Composition Poster Design” project has yielded a plethora of creative works. Two representative examples are analyzed:

4.5.1. Case study 1: “Tranquility” theme poster

Work description: Predominantly cold tones (blue, cyan) with a large rectangular area and slender horizontal lines. It includes soft circular color blocks and a few extremely fine horizontal lines. The composition leans towards symmetrical balance.

Composition principle analysis: Plane composition (rectangles create a sense of space, soft edges enhance tranquility); Line composition (horizontal lines provide a sense of stable extension); Color composition (cold tones are harmonious and unified, conveying tranquility); Balance and unity (approximate symmetry, visual

balance).

PS tool utilization: skilled use of shape tools, layer masks, and Gaussian blur filters to achieve soft edges; Solid color adjustment layers and gradient tools for precise color control; Clear layer management.

4.5.2. Case study 2: “Vitality” theme poster

Work description: Dominated by warm tones (orange, yellow, red), the poster features a profusion of lines varying in thickness (diagonal and curved) and irregular shapes. The image is filled with radial and spiral elements, creating a strong sense of dynamism and bright, saturated colors. Compositional principles analysis: Line composition (diagonal, intersecting, and radial lines create a sense of speed and direction, while curves add flexibility); Shape composition (irregular shapes intertwined and overlapping to enhance momentum); Color composition (high-purity warm color contrasts, gradients to enhance a sense of liveliness, conveying passion); Rhythm and meter (repeating arrangements of elements of different sizes, forming a diffusive visual rhythm).

PS tool utilization: Skillfully using the Pen Tool to draw complex curves and irregular shapes; duplicating layers and freely transforming them to quickly generate repeating elements; using blending modes and layer styles to enhance effects; precisely controlling color fills and gradients.

Summary: The integrated teaching approach allows students to: 1. More intuitively understand compositional principles; 2. Enhance digital practical skills; 3. Stimulate innovative thinking. This approach significantly compensates for the deficiencies of traditional teaching methods.

5. Teaching effectiveness evaluation

To comprehensively evaluate the effectiveness of the integrated teaching model, this study employs various quantitative and qualitative methods, including student surveys, teacher observation and reflection, and comparative analysis of student works before and after the intervention.

5.1. Design of evaluation methods

5.1.1. Student questionnaire survey

Purpose: To quantitatively evaluate students’ acceptance of the model, learning interest, improvement in PS skills, understanding of compositional principles, and cultivation of innovative thinking. Content: The survey adopts Likert five-point scale multiple-choice questions and open-ended questions, covering interest in PS-assisted learning, self-perceived improvement in PS skills, clarity of understanding compositional principles, confidence in digital expression, and satisfaction with project-based teaching.

Recipients: All 30 students.

5.1.2. Teacher observation and reflection

Purpose: To qualitatively analyze students’ classroom engagement, problem-solving, collaboration, and teaching issues. Content: Teachers record students’ PS operations, compositional ideas, and teacher-student interaction performance, and write teaching logs after class to reflect on strengths and weaknesses.

5.1.3. Comparative analysis of works before and after

Purpose: To visually evaluate students’ improvement in PS skills and compositional design abilities. Method: Compare works before and after teaching, evaluating compositional relationships, visual effects, PS technique

application, and innovativeness. Scoring: Anonymous scoring by the instructor and two design professionals.

5.2. Analysis of evaluation results

In the student questionnaire survey, learning interest increased significantly: 90% of students liked the integrated model and believed that combining it with PS was more interesting and practical. PS skills improved significantly: 85% of students believed that their PS operation skills (such as layers, masks, etc.) had improved significantly. Deepened understanding of compositional principles: 78% of students indicated that their understanding of compositional principles became more intuitive and profound through PS practice. Enhanced digital expression ability: 82% of students improved their confidence and ability in digital visual expression. Satisfaction with project-based teaching: 88% of students liked project-based learning and believed that it allowed them to apply what they had learned.

Teacher observation and reflection: Class participation is high, students' problem-solving abilities have improved, and innovative works have emerged. However, some students with weak Photoshop skills need more guidance, and the allocation of course time needs to be optimized.

Comparison of works before and after: There has been a significant improvement in the completion and visual effects of the works, compositional relationship expression, digital features, and innovation.

Conclusion: The integrated teaching model has achieved remarkable results, effectively improving students' Photoshop skills, understanding of compositional principles, learning interest, digital expression ability, and innovative thinking, thus compensating for the deficiencies of traditional teaching methods.

6. Existing problems and teaching reflection

Although the integrated teaching model has achieved positive effects, there are still challenges in practice that require continuous reflection and improvement.

6.1. Challenges encountered in practice

1. Large differences in students' Photoshop foundations: Some students with no foundation spend a lot of time in the initial stage, affecting their learning of compositional principles. It is necessary to consider students with different foundations. 2. Balancing teaching time and content allocation: Compositional theory and Photoshop skills are complex, and class time is limited, making it difficult to balance teaching content and practical time. 3. Sustainable demand for teachers' ability improvement: Teachers need to continuously learn new Photoshop functions and digital design trends, and improve their teaching design abilities for integrating theory and tools. 4. Maintenance and upgrading of software and hardware facilities: Photoshop has high requirements for computer configuration, and software updates are frequent. Equipment failures can affect teaching. 5. Complexity of homework correction and evaluation: The evaluation dimensions have increased (compositional principles, Photoshop skills, innovation), which requires higher professional judgment from teachers.

6.2. Improvement measures for the issues

To optimize the integrated teaching model in the future, the following measures can be considered: 1. Stratified teaching and personalized guidance: Conduct diagnostic tests to assess students' Photoshop (PS) foundations, provide additional tutorials or coaching, and assign tasks tailored to different levels in the classroom. 2.

Optimizing course content and time management: Streamline theories, highlight key points, select projects carefully to ensure adequate exploration time, and strengthen pre-class preparation and post-class expansion. 3. Enhancing teachers' professional development: Organize regular advanced Photoshop training, encourage experience sharing, and invite industry experts to give lectures. 4. Improving software and hardware environment: Regularly update computer lab equipment and software versions, and provide unified installation packages. 5. Establishing a diversified evaluation system: Improve process-based evaluation, introduce peer review and group presentations, and establish clear scoring criteria.

6.3. Teaching reflection and experience summary

This exploration of integrated teaching has provided valuable experience for the reform of basic art and design courses. Digitization is a trend in design education, and the deep integration of traditional theories with modern digital tools is key to cultivating design talents who meet the demands of the times.

Key experience summary: Project-driven learning is the core, and incorporating digital design projects significantly enhances learning interest and practical abilities. Photoshop is an extension of compositional thinking and an important platform for students to explore compositional possibilities and realize their creativity. Teachers should take on the role of guides, shifting from being knowledge providers to learning facilitators, providing technical and design inspiration. Continuous reflection and improvement are essential. Teaching reform is a dynamic process that requires constant summation, problem identification, and iterative optimization. Through continuous reflection and improvement, the integrated teaching model will be continuously refined, contributing to cultivating artistic design talents with innovative spirits and digital literacy.

7. Conclusion

This study has delved into and practiced the integrated teaching mode of "Composition Design + PS Tools." By analyzing the limitations of traditional teaching methods, the necessity of deep integration in the digital age has been clarified. The research constructed a fusion model based on constructivism and project-based learning, which was systematically verified in teaching practice. The practical results indicate the following points: 1. Enhanced understanding of compositional principles: intuitive PS operations enable students to explore compositional elements and principles more intuitively and flexibly, deepening aesthetic cognition. 2. Significantly enhanced practical ability in digital design: students have mastered the core operations of PS, using it as a tool to realize compositional ideas and solve visual problems. 3. Stimulate interest in learning and innovative thinking: the modifiability and efficiency of PS encourage bold and creative attempts, increase initiative, and produce more digitally distinctive and innovative works. 4. Provide a feasible path for the reform of art and design foundation courses: integrating basic theory with mainstream digital tools is an effective way to improve teaching quality and cultivate interdisciplinary talents.

Disclosure statement

The authors declare no conflict of interest.

References

- [1] Li M, 2018, Transformation and Development of Art Design Education in the Digital Age. *Art Education*, 2018(3): 20–23.
- [2] Zhang H, 2019, Research on Teaching Reform of Composition Design Courses. *Art Panorama*, 2019(6): 112–113.
- [3] Cao L, 2020, Research on the Application of Photoshop in Visual Communication Design Teaching. *Art Science and Technology*, 2020(4): 180–182.
- [4] Jonassen DH, 1991, Objectivism Versus Constructivism: Do We Need a New Philosophical Paradigm? *Educational Technology Research and Development*, 39(3): 5–14.
- [5] Thomas JW, 2000, A Review of Research on Project-based Learning. The Autodesk Foundation, California. http://www.bobpearlman.org/BestPractices/PBL_Research.pdf

Publisher's note

Bio-Byword Scientific Publishing remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Enhancing Space English Teaching: Application of the BOPPPS Model in Space English Classrooms

Min Qiu*

Space Engineering University, Beijing 101416, China

**Author to whom correspondence should be addressed.*

Copyright: © 2025 Author(s). This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0), permitting distribution and reproduction in any medium, provided the original work is cited.

Abstract: This paper explores the application of the BOPPPS teaching model in Space English education to address the limitations of traditional methods. Incorporating the six steps of the BOPPPS model—Bridge-in, Learning Outcomes, Pre-assessment, Participation, Post-assessment, and Summary—into Space English classrooms can enhance student engagement, improve cross-cultural communication, and combine space knowledge and language proficiency, ultimately improving the effectiveness of Space English teaching and better preparing students for global space collaboration.

Keywords: Space English; BOPPPS; Teaching model

Online publication: September 18, 2025

1. Introduction

With the rapid advancement of global space exploration, international cooperation in space-related activities has become increasingly important ^[1]. As the universal language of the space sector, English plays a critical role in ensuring effective collaboration among space personnel worldwide ^[2]. Mastery of Space English has thus become an essential skill for participating in global space initiatives ^[3]. To enhance students' ability to use English in their professional studies and future careers, several Chinese universities have introduced Space English courses for undergraduate students majoring in space engineering or have integrated Space English content into their regular English curriculum. However, most programs still rely on the traditional teaching model of reading, translation, and writing, which strengthens students' reading and writing abilities but falls short in developing cross-cultural communication skills and practical language application ^[4]. Moreover, these courses focus primarily on the professional content in the reading materials, leading to a significant gap in integrating English with space-related knowledge. Therefore, this study aims to explore how the BOPPPS teaching model can be applied to reform and enhance the Space English classroom, improving the overall

effectiveness of Space English education.

2. Framework of the BOPPPS model

The BOPPPS teaching model originated in the 1970s within the community education system in British Columbia, Canada. It is a goal-oriented instructional framework that prioritizes teacher-student interaction. Initially developed for use in Canadian Instructional Skills Workshops (ISW), the BOPPPS model has gained global popularity due to its practicality and effectiveness, becoming a standard tool in teacher training ^[5]. The model consists of six steps: Bridge-in, Learning Outcomes, Pre-assessment, Participation, Post-assessment, and Summary ^[6]. By clearly defining learning objectives and fostering greater classroom interaction and feedback, the BOPPPS model enhances student engagement and improves overall classroom effectiveness, enabling students to better absorb knowledge and apply it in real-world contexts ^[7].

2.1. Application of the BOPPPS model in Space English classroom teaching

The structured approach of the BOPPPS model effectively enhances classroom interaction and student participation, enabling students to master the terminology and professional knowledge of Space English more effectively ^[8]. As a result, implementing the BOPPPS model in Space English instruction is crucial for improving learning outcomes.

2.1.1. Bridge-in

The Bridge-in step establishes a context that connects new knowledge to students' prior understanding, capturing their attention and sparking interest in the subject ^[9]. In Space English instruction, this step can be implemented in various ways. For instance, when teaching the topic of "Space Environment", the teacher can show a real video of the Tiangong Space Station or a documentary featuring Chinese astronauts conducting spacewalks, immersing students in authentic space mission scenarios. The video can introduce key space terminology, such as "microgravity", "vacuum", and "radiation", helping students seamlessly integrate English language learning with space concepts through both visual and auditory stimuli.

2.1.2. Learning outcomes

Setting clear learning outcomes ensures that educational goals are precisely defined ^[10]. In the 1950s, American educational psychologist Benjamin Bloom introduced Bloom's Taxonomy of Cognitive Domains, which categorizes cognitive abilities into six levels, from basic to advanced: Knowledge, Comprehension, Application, Analysis, Synthesis, and Evaluation ^[11]. Bloom's theory highlights the hierarchical and systematic nature of learning objectives, enabling teachers to design course content that aligns with students' cognitive development and facilitates progressive learning.

In teaching Space English, teachers can utilize Bloom's taxonomy to establish learning goals that progress from basic to advanced levels, guiding students from mastering foundational knowledge to developing higher-order thinking, thereby fostering cognitive growth. For example, when teaching "Satellite Navigation", the learning objectives for beginner, intermediate, and advanced levels might include: accurately expressing basic satellite navigation terminology and concepts in English and explaining how the system operates; describing the application of satellite navigation technology in space missions and analyzing its strengths and limitations in various environments; and evaluating the effectiveness of different satellite navigation systems and suggesting

potential improvements. By setting progressively higher goals, this approach not only enhances students' language proficiency but also promotes the integration of space knowledge, critical thinking, and problem-solving skills.

2.1.3. Pre-assessment

Using students' prior knowledge encourages student involvement in the learning process ^[12]. The pre-assessment step enables teachers to gauge students' prior knowledge, skill levels, and learning needs. By carefully designing pre-assessment activities, Space English teachers can tailor classroom content and teaching methods to better address students' needs. For instance, when teaching the topic "Launch and Recovery", the pre-assessment can include a brief questionnaire or a small quiz to evaluate students' understanding and their ability to use specialized vocabulary such as "launch vehicle", "recovery operation", and "trajectory." Additionally, oral questioning or group discussions can prompt students to share their perspectives on launch and recovery, stimulating their critical thinking and preparing them for the lessons ahead.

2.1.4. Participation

Participation-based learning emphasizes active student engagement in the classroom ^[13]. It goes beyond mere knowledge delivery by fostering interaction and application, enabling students to learn through practice. In Space English classrooms, teachers can encourage students to apply what they have learned in real or simulated contexts through discussion, collaboration, and hands-on activities. For example, when teaching "Space Launch Sites", the teacher can divide students into groups, with each group responsible for presenting in English the functions, structural features, and roles of various components of the launch site (such as the assembly plant, launch tower, fueling system, and control center). By researching, organizing materials, and delivering oral presentations in English, students not only deepen their understanding of key launch site components but also significantly enhance their English communication skills, fostering a dual improvement in both language proficiency and professional competence.

2.1.5. Post-assessment

After the teaching activity, the teacher can employ various forms of assessment, such as quizzes, task presentations, or oral reports, to evaluate whether students have met the learning objectives. The post-assessment not only wraps up the learning process but also reinforces knowledge, enhances skills, and provides valuable feedback for teaching ^[14]. For instance, when covering the topic of "Space Environment", the post-assessment can involve students working in groups to deliver an oral report on the characteristics of the space environment (such as microgravity, radiation, and vacuum) and their effects on spacecraft design and astronaut health. Students should consult English-language sources, correctly use space-related terminology, and present their findings in English. This post-assessment strengthens students' understanding and communication of professional knowledge while also improving their ability to synthesize information, structure language, and engage in cross-cultural communication, leading to a deeper integration of language proficiency and domain-specific expertise.

2.2. Summary

Before the end of the class, teachers guide students in reviewing the material covered, organizing their

knowledge structures, and reflecting on the learning process. This not only helps students reinforce their understanding and solidify key concepts but also prepares them for future learning ^[15]. In the Space English classroom, when teaching “Satellite Communication”, the teacher can prompt students to review core concepts and terms discussed in the lesson, such as “geostationary orbit” and “uplink/downlink”, and briefly explain their functions and applications in English. Through this summary step, students not only consolidate the knowledge they have acquired but also improve their ability to articulate concepts and organize ideas logically in English, thereby laying a strong foundation for further study.

3. Conclusion

In conclusion, incorporating the BOPPPS teaching model into Space English classrooms enhances both the structure and interaction of the teaching process, significantly improving students’ ability to use English in professional contexts. By integrating the six steps—Bridge-in, Learning Outcomes, Pre-assessment, Participation, Post-assessment, and Summary—teachers can effectively assess students’ learning progress, design targeted teaching activities, and support their holistic development in knowledge acquisition, language expression, critical thinking, and cross-cultural communication. Particularly in mastering space terminology, applying English in real-world contexts, and simulating space missions, students achieve a deep integration of language skills and professional expertise. Looking ahead, the BOPPPS model holds substantial potential for furthering Space English teaching reforms, contributing to the cultivation of high-quality talent with both global perspectives and professional competence, and fostering the international growth of China’s space industry.

Disclosure statement

The author declares no conflict of interest.

Reference

- [1] News Burst Mag, 2023, Space Exploration: International Collaboration beyond the Earth. News Burst Mag, November 29, 2023, accessed on June 1, 2025. <https://www.newsburstmag.com/space-exploration-international-collaboration-beyond-the-earth/>
- [2] Crystal D, 1996, English as a Global Language, 1st ed. Cambridge University Press, Cambridge.
- [3] George PJ, Pease GM, Tyburski TE, 2005, A Management Model for International Participation in Space Exploration Missions. *Journal of Spacecraft and Rockets* 42(3): 567–578.
- [4] Cheng HL, 2023, Intercultural Communication and English Reading and Writing Teaching. *Journal of Language Teaching and Research*, 14(3): 456–478.
- [5] Zhang JX, Zhu L, 2016, Effective Classroom Teaching Design Based on BOPPPS Model. *Vocational and Technical Education*, 37(11): 25–28.
- [6] University of British Columbia, 2025, Designing Lessons with BOPPPS. Accessed on June 1, 2025. <https://researchcentres.wlu.ca/teaching-and-learning/building/designing-lessons-with-boppps.html>
- [7] Li Y, 2016, Effective Teaching: Application of BOPPPS Model in ESL Class. *Advances in Economics, Business and Management Research*, 2016(20): 433–440.
- [8] Pattison P, Russell D, 2006, Instructional Skills Workshop Handbook. UBC Centre for Teaching and Academic

Growth, Vancouver.

- [9] Zeng DH, 2024, Research on Blended Teaching in Integrated English Course Based on BOPPPS Model. *Journal of Contemporary Educational Research*, 8(9): 134–138.
- [10] Renner PF, 1977, Some of the Reasons and Advantages of Clearly Stated Instructional Objectives. *BCIT Developments*, 1977(2): 2.
- [11] Bloom BS, 1956, Taxonomy of Educational Objectives: The Classification of Educational Goals. Handbook I: Cognitive Domain. David McKay Company, Denver.
- [12] Oberg C, 2025, Guiding Classroom Instruction through Performance Assessment. *Journal of Case Studies in Accreditation and Assessment*. Accessed on June 1, 2025. <http://aabri.com/manuscripts/09257.pdf>
- [13] Smith KA, Sheppard SD, Johnson DW, et al., 2005, Pedagogies of Engagement: Classroom-based Practices. *Journal of College Teaching*, 5(1): 1–10.
- [14] Anderson L, Krathwohl D, Bloom BS, 2000, A Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives. Longman, New York.
- [15] Chen BW, 2024, The Study on the Method of Introduction, Transition, and Summary Techniques in University Classroom Teaching. *Journal of Educational Research and Practice*, 5(2): 88–105.

Publisher's note

Bio-Byword Scientific Publishing remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Research on the Reform of College English Oral Teaching in Applied Undergraduate Colleges

Xu Wu*

Xiangtan Institute of Technology, Xiangtan 411100, Hunan, China

**Author to whom correspondence should be addressed.*

Copyright: © 2025 Author(s). This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0), permitting distribution and reproduction in any medium, provided the original work is cited.

Abstract: Improving students' practical abilities is an important part of the educational teaching in the applied undergraduate colleges. Oral English ability is a key educational goal for college students to improve their English proficiency. Nevertheless, it is still not very effective at present, as far as our oral English teaching is concerned. This paper first investigates the current situation and problems in oral English teaching at applied undergraduate colleges. It further discusses the suitable teaching models of the college and puts forward some effective suggestions for improvement, aiming to provide more efficient talent development.

Keywords: Applied undergraduate colleges; College English; Oral teaching

Online publication: September 18, 2025

1. Introduction

Roused by national education policies and actively promoted, undergraduate education has become a main characteristic of the education system. Under this backdrop, English, as one of the important means for technical exchange and cultural interaction across the world, has also gained increasing attention, and spoken English ability, one of the core competencies for practical workers, has been particularly emphasized in the Ministry of Education's College English Teaching Guide (2020 Edition)^[1]. Although people have already realized the importance of spoken English, many applied undergraduate colleges do not pay enough attention to oral English teaching. This is because they place greater emphasis on cultivating the ability to practice skills and techniques in practice.

Currently, students of non-English majors in applied undergraduate colleges all encounter the "muteness" of English to some extent. Studies indicate that approximately 4.98% of students are "very good" in oral English according to self-evaluation, and more than three-fourths of the students encounter various difficulties, including their poor fluency and expressions, inappropriate conversation, and rather poor language expressions for communicating and work^[2]. This scenario indicates a severe imbalance exists between the methods taught by

conventional oral English classes and the skills necessary for applied professionals. Wang Jingjing has indicated that, under the professional application-oriented English teaching in oral teaching, there are still some problems, including an overemphasis on theory at the expense of practice, limited teaching methods, and disparities in students' foundational English proficiency. This leads to the fact that the efficiency of professional application-oriented oral English teaching is not high. Students still fail to meet market demands in actual employment ^[3]. So, this paper starts from the state of teaching of college English oral in the applied undergraduate colleges, in order to find effective teaching means and improve the applied English oral teaching.

2. The current situation of college English oral teaching in applied undergraduate colleges

At present, the college oral English teaching in applied undergraduate institutions is facing various challenges, and the current situation is not optimistic. The author will conduct an analysis from three aspects: the design of the college English curriculum, students' English proficiency and motivation levels, and teachers' teaching models.

2.1. Issues in college English curriculum design and the neglect of oral English instruction

For so long a time, college English teaching has neglected oral English teaching. Although enthusiasm for English education continues to grow in China, Chinese students' competence in oral English is still not satisfactory in general. Taking Xiangtan Institute of Technology, where the author works, as an example, in the setting of college English courses, the course content is usually divided into two main parts: the Comprehensive Course and the Video-Audio-oral Course. These two parts correspond to two different textbooks, respectively, aiming to comprehensively improve students' English abilities. However, in the actual course arrangement, the Comprehensive Course occupies the vast majority of class hours, while the proportion of class hours for the Video-Audio-oral Course is very small.

Take the arrangement of a college English course for sophomores as an example, only two class hours of English teaching per week and a total of 32 class hours per semester, of which only 8 class hours are for the Video-Audio-oral Course, so there is a very brief exercise time for students to practice spoken English. In this way, the situation becomes more severe in junior and senior years, due to there not being any college English lessons given in these two years, and students losing the opportunity to further exercise and enhance their oral English skills. This unevenness in teaching targets of courses has caused a severe lack of students' oral English training opportunities. Insufficient oral training opportunities caused students to be helpless in actual English communication. And the phenomenon not only influences the improvement of students' personal English ability, but also has adverse effects on the future employment of students' working competition strength.

Then, most applied undergraduate colleges have not yet established a complete oral English curriculum system. In these colleges, oral English teaching is usually integrated into the college English audio-visual speaking courses, and no special oral English proficiency assessment mechanism has been established. Gao Dexin and Yu Xiujin pointed out that although many universities have offered reading, writing, and listening courses for non-English major students, students "hardly have the opportunity to speak", and the oral English teaching part in reading and writing classes is just "skimming over the surface" ^[4]. Due to the lack of attention to oral English teaching, both teachers and students generally pay little attention to this skill. As a result, oral

English teaching often only stays on the surface form and fails to be effectively implemented, thus leading to insignificant teaching results.

2.2. Students with weak academic foundations and low levels of learning motivation

Learning motivation can be understood as the inclination to start and sustain different types of learning behaviors. It functions as an internal driving force that encourages students to actively engage in educational activities. Based on Maslow's hierarchy of needs theory, learning motivation can be divided into two main categories: intrinsic and extrinsic. Intrinsic motivation arises from internal learning needs, such as a learner's curiosity or interest in the subject matter. On the other hand, extrinsic motivation is influenced by external factors, such as encouragement from parents, praise from teachers, or job-related demands, which serve as incentives to learn.

The undergraduate college students of non-English majors think college English courses are not a key part of their majors, they don't care about college English courses, and have no interest in college English courses. Compared with English major students, non-English major students have a relatively weak "language knowledge system (including vocabulary, morphology, and syntax)." They often encounter obstacles in oral communication due to insufficient vocabulary ^[5]. The author observes that students in applied undergraduate colleges generally have a weak foundation in English. It is quite difficult for students to express their ideas smoothly in oral English classes. Gradually, they become less and less confident in their oral English ability. In addition, most Chinese students are more introverted and are unwilling to communicate with others in class about their minds and thoughts, let alone communicate with strangers. Without practice, their oral English cannot be improved. A survey demonstrates that Chinese students' poor oral English skills are caused by a lack of confidence and anxiety about learning a second language. Lack of good oral expression leads to a lack of ability to transmit English messages. There are mainly four reasons for foreign language anxiety: students with a pessimistic attitude to the classroom environment, afraid to communicate, afraid of being criticized, and afraid of examinations. In this way, most students lack motivation for speaking English ^[6].

Regarding the system of college English education, college students receive only English courses in their freshman and sophomore years. In this period, college students have just ended the hard study life in high school, and then they have a relatively high and free period of college life. They may lose interest in studies and lack the sense of initiative, resulting in a passive attitude of passively listening to teachers. Second, some students feel that their future work English application is very limited, and they have not realized the importance of English learning from an international perspective. This lack of external motivation also results in a poor learning effect of college English due to students' slow oral English learning.

2.3. The oversimplified teaching mode and the outdated teaching methodology

The main purpose of college English teaching is to cultivate students' comprehensive skills and application abilities in listening, speaking, reading, and writing, enabling them to conduct daily cross-cultural communication, so as to enhance students' comprehensive cultural qualities and cross-cultural awareness, and to promote traditional Chinese culture in English ^[7]. However, at the applied undergraduate colleges, college English teaching often places too much emphasis on final exam scores and the passing rate of the college English test. Teachers spend a great deal of time explaining vocabulary and grammar and conducting intensive training on problem-solving skills for the college English Test Band 4 and Band 6. This leads to an excessive

emphasis on the one-way input of English language knowledge and British and American cultures in teaching. In the traditional teaching model, teachers play the role of instillers in the teaching activities, “teacher’s presentation” being the center of classroom activities, while students just passively receive knowledge, which leads to the students’ neglect of their active learning. The author still witnesses some teachers using very traditional educational thinking and methods. As can be seen from some oral English classes, in the traditional situation, the language education between teachers and students is infrequent; This conventional “one-size-fits-all” teaching method does not address the different learning styles and needs of students^[8].

The English course, as a foundation course for colleges and universities, is usually taught by only one teacher and attended by dozens, or even hundreds, of students. From observation of classroom teaching, most of the teachers adopt a teacher-centered classroom teaching model, which emphasizes the presentation and interpretation of the knowledge points in the textbook step by step. However, this approach tends to limit the opportunities for students’ independent study, critical thinking, and oral practice, resulting in poor and insufficient student initiative in class, a lack of motivation, feeling bored in class, and a one-way knowledge transmission still dominates in class. Secondly, students lack sufficient opportunities for oral expression and practice in English classes, and their oral English proficiency falls far short of expectations.

3. Strategies for reforming college English oral teaching in the context of applied talent development

To break through the current difficulties in college English oral teaching and effectively serve the goal of cultivating applied talents, teaching reform must identify key entry points and advance systematically. First, traditional perceptions should be transformed to elevate the status of oral instruction within the overall curriculum system. Second, stimulating students’ learning interest is a critical link in the reform. Only by prioritizing oral teaching in mindset and effectively mobilizing students’ learning motivation can a solid ideological foundation and sustained momentum for reform be provided. Ultimately, the realization of teaching effectiveness relies on substantive innovation in classroom teaching models.

3.1. Giving oral English training a high priority and establishing a diversified and vibrant learning atmosphere

To study language, the oral is the most important step. To listen is the basis of speaking, while listening and speaking are good for reading and writing. The more chances students are given to get in touch with English, the stronger their comprehensive ability to grasp English will be. At present, applied undergraduate colleges usually attach importance to the cultivation of their characteristic and advantageous disciplines, but there are still relatively insufficient investments in college English teaching, especially in college students’ oral English teaching. With the progress of society, especially due to the trend of economic globalization, China’s international exchanges have become increasingly close. Thus, proficient oral English communication has become a crucial factor to enhance students’ professional competitiveness.

Applied undergraduate colleges have to make the instruction of oral English a top priority in their strategic development plan by adding it. This includes providing systematic support in areas such as course design, the allocation of teaching resources, and the development of teaching staff. Firstly, educators might appropriately increase the proportion of oral English teaching in the course system to guarantee the students’ adequate opportunities for practice and experience. After that, educators should introduce advanced teaching

aids to enrich teaching methods and increase the interaction and efficiency of English learning. Meanwhile, a professional development program for oral English teachers should be conducted to improve their teaching skills and overall abilities for maintaining a high level of teaching quality. This strategy is expected to improve the students' oral English ability and their competitiveness in the job market.

Furthermore, application-oriented undergraduate colleges should also establish a genuine English learning environment for their students. According to Numan, a key principle in teaching oral English is offering learners ample chances to use the language in meaningful and relevant contexts^[9]. For instance, at Xiangtan Institute of Technology, where the author is employed, the college—oriented towards practical application—has held diverse English-related events, including English conversation gatherings, English speaking competitions, and multilingual voice-over contests. These initiatives not only enhance students' campus experiences but also foster greater enthusiasm for learning English.

3.2. Applying established teaching theories to effectively stimulate students' motivation in learning oral English

Linguist Giles emphasizes that the drive to acquire a second language plays a crucial role in achieving proficiency^[10]. Clearly defined learning objectives can foster a positive mindset. For instance, goals such as “desiring to understand the cultures of English-speaking countries” or “aspiring to communicate with international peers” serve as strong motivators. A critical challenge that oral English instructors must address is how to integrate well-established pedagogical theories into spoken language instruction and effectively inspire students' enthusiasm for learning oral English.

Wen Qiufang was a professor in the China Foreign Language Education Research Center of Beijing Foreign Studies University in 2015. She took the lead in a research group led by the combined major outcomes in Second Language Acquisition, such as Krashen's Input Hypothesis and Swain's Output Hypothesis. According to comprehensive research on the situation in foreign language education in China today, Wen advocated a new China-oriented method of foreign language teaching — The Production-Oriented Approach (POA)^[11]. This theoretical system consists of three parts: teaching concepts (learning-centered theory, integrated learning and application theory, and holistic education theory), teaching assumptions (output-driven, input-facilitated, and selective learning), and teaching processes mediated by teachers (driving, facilitating, and evaluating).

There are currently many scholars who have examined teaching design issues within the context of the Production Oriented Approach (POA) at different phases of the teaching process, such as the “driving” phase and the “facilitating” phase^[12–13]. In addition, ample empirical evidence has shown that following this theoretical teaching model can help improve students' listening and speaking skills. In the long process, the POA has become a relatively mature teaching pattern in China, and teachers can learn relevant teaching plans put forward by some scholars for reference in their teaching. In oral English teaching, by guiding the teaching pattern of POA, the students are not a passive “spectator”, and they need to become the subject of every learning phase. In the driving phase, students converse and choose materials of English to be taught by the instructor from practical situations to foster the learning interest. In the facilitating phase, students work in groups, interact with each other, accomplish spoken tasks and express their opinions, and then improve their oral skills in English. Based on the author's conviction, using the Production-Oriented Approach in university oral English courses can enhance students' enthusiasm for studying oral English courses and remarkably enhance students'

oral expression ability.

3.3. Transforming the oral English teaching model

Because the class hours for English in college are limited, students rarely get speaking practice in class. As a result, the oral communication skills of college students tend to be poor because they do not have enough time to practice speaking, which affects their oral proficiency performance. Under the constant development of internet technology, the traditional teaching mode can no longer arouse the students' passion and satisfy their various learning requirements, so applying the modern teaching aids to teaching can effectively enrich teaching modes and stimulate students' learning passion. For instance, artificial intelligence can help educators promote a switch from a teacher-centered education to a learner-centered one. AI in education has gradually developed, and its influence on learning English has been an ever-increasing research interest ^[14].

Firstly, artificial intelligence — particularly in the form of adaptive learning — makes possible the shift from the more conventional, lecturer-dominated paradigm to learner-oriented education. For example, as educators use data-driven algorithms to dynamically adapt the teaching content, teaching methods, and teaching pace of the students based on the interests, knowledge level, and interaction status of the students, a highly personalized and efficient learning process (i.e., highly efficient and effective teaching) will be achieved. Teachers can use AI technologies to collect students' learning information, like learning records, learning levels, and lack of learning content, and then formulate personalized learning plans, such as recommending suitable practice materials for learning students' speech features. Furthermore, based on the class students' statistical information, teachers can dynamically adjust teaching knowledge points and teaching methods, so as to achieve better targets for the majority of students. Moreover, the personalized learning powered by the AI, as well as various and open teaching resources provided by AI, enables the students to break through the boundary of time and space of traditional classrooms; This fosters active learning by granting access to a wealth of educational materials, promoting the development of self-directed learning abilities and a mindset oriented toward lifelong learning ^[15].

Then, with the help of AI, educators can transform the teaching models into more multimodal and innovative modes. Multimodal education provided by AI brings fresh vigor, in that multimedia delivery modes—visual, auditory, and tactile information—are merged in order to form a relaxing and intimate learning atmosphere to decrease students' oral expression anxiety. The extension with AI allows multimodal teaching to have intelligence and personalization. It can analyze students' learning habits and proficiency levels, customize matching multimodal materials (such as dialogue scenarios that combine videos, images, and sounds), evaluate oral practice in real time, and provide precise feedback (such as correcting pronunciation and grammar mistakes), which enables students to efficiently improve their oral English skills in a diverse environment and AI integrate with VR technology provide immersive teaching. Students can participate in role-playing exercises and interact with virtual characters within simulated real-life scenarios—such as dining establishments, hotels, and international conferences. In this way, students can greatly improve their oral communication skills as well as their ability to think and respond spontaneously.

Lastly, with the AI-assisted assessments, in the long run, the evaluation systems can evolve toward greater objectivity and a focus on continuous progress. Traditional oral assessment systems heavily depend on manual assessments, which leads to a lack of consistency and precision. The intelligent evaluation platform adopts NLP and artificial intelligence technology for the full and real-time assessment of multiple attributes of students'

oral situation, including oral pronunciation, pitch, speaking speed, word expression, grammar, fluency, etc. This has promoted the transformation of the evaluation method from a single summative evaluation — mainly based on test scores, teacher-dominated, with students in a passive role — to a combination of summative and formative evaluations. The latter stresses the students' learning rather than the teacher's assessment, resulting in a more positive learning attitude for students. At the same time, it helps students develop gradually and timely manner because of its multivector character. Meanwhile, with its high objectivity and efficiency, compared to human evaluation, AI evaluation has attracted more attention in recent years. It offers in-depth information for individual learners' problematic points, which greatly lowers the burden of teachers' evaluation work and helps teachers better focus on each student's customized learning demands and differences. Meanwhile, real-time analysis can help teachers understand teaching problems, develop teaching plans, and finally enhance the effectiveness of teaching.

Artificial intelligence's profound application in college English oral teaching is unfolding a profound revolution in the education system, which has made teaching more efficient and effective via intelligent teaching methods, personalized teaching, and intelligent evaluation.

4. Conclusion

So far, the oral English skills of most university students can only be trained in oral English courses. There are still some important factors that greatly hinder the training of spoken English: The curriculum for spoken English is unscientific and impractical to implement; there is a lack of systematic instruction from instructors; oral abilities are not emphasized; students lack inner motivation; there is a lack of fully immersive foreign language environments; and the conventional classroom teaching model has drawbacks, etc. If the applied undergraduate colleges want to make the oral English teaching better, then the active cooperation between teachers and students must be required. On one hand, the applied undergraduate colleges should take proactive steps to organize various oral English activities and optimize the specialized teaching staff training and development. On the other hand, teachers ought to go beyond the traditional and monotonous teaching methods, use artificial intelligence in teaching and update their teaching methods, and accept more fashionable teaching methods, such as the Production-Oriented Approach, to improve oral English teaching and stimulate students' active participation to the largest extent. Therefore, besides the guidance from educators, college students as active subjects in oral English learning must also see the importance of oral English, regulate learning attitudes, and actively participate in class activities. As a result, only joint efforts among colleges, teachers, and students can effectively resolve the issue of “dumb English” among college students, thereby cultivating high-quality, well-rounded talents for the country.

Disclosure statement

The author declares no conflict of interest.

References

- [1] The College Foreign Language Teaching Steering Committee of the Ministry of Education, 2020, College English Teaching Guide: 2020 Edition. Higher Education Press, Beijing, 5–17.

- [2] Jiang MF, Han KP, 2023, A Survey of Oral English Expression Ability of College Students in Applied Universities. *Modern Linguistics*, 11(12): 6273–6284.
- [3] Wang JJ, 2022, Research on the Reform of Oral English Teaching for International Trade Majors in Application-Oriented Undergraduate Programs: Taking Chaohu University as a Case Study. *Overseas English*, 2022(12): 120–126.
- [4] Gao DX, Yu XJ, 2008, Oral English Teaching in Network Environment. *Computer-Assisted Foreign Language Education in China*, 2008(5): 57–62.
- [5] Gao HH, 2000, How to Conduct College English Oral Teaching. *Computer-Assisted Foreign Language Education*, 2000(2): 3–6 + 19.
- [6] Wang RZ, 2023, Influencing Factors and Countermeasures of Chinese Students' Oral English Proficiency. *Journal of Education, Humanities and Social Sciences*, 2023(13): 158–164.
- [7] Dou WN, 2023, Reform and Practice of College English Teaching for the Cultivation of Internationalized Talents. *Overseas English*, 2023(4): 4–6.
- [8] Kang ZF, Lu XY, 1998, Oral English Teaching in China: The Status Quo, the Problems and Solutions. *Foreign Languages and Their Teaching*, 1998(9): 32–35 + 57.
- [9] Duan TT, 2015, Research on the Current Situation of College Oral English and Writing Teaching. *Journal of Educational Institute of Jilin Province*, 2015(7): 63–65.
- [10] Liu WH, 2007, Analysis of the Current Situation of College Students' Oral English Ability and Thoughts on Improvement Approaches. *Journal of Xiangtan Normal University (Social Science Edition)*, 2007(3): 214–215.
- [11] Wen QF, 2015, Developing a Theoretical System of Production-oriented Approach in Language Teaching. *Foreign Language Teaching and Research*, 47(4): 547–558 + 640.
- [12] Yang LF, 2015, Designing a Micro Lecture for the Motivating Phase of the POA Teaching Process. *Foreign Language Education in China*, 2015(4): 3–9.
- [13] Zhang WJ, 2015, “Enabling” Student Production to Enable Students' Language Development: Applying Production-oriented Approach to TEFL Classroom. *Foreign Language Education in China*, 2015(4): 10–17.
- [14] Wang Y, 2023, A Study on the Factors Influencing the Behavioral Intention of College Students Using Artificial Intelligence Technology to Assist in Mobile Learning of English Vocabulary. *Modern Distance Education*, 2023(5): 72–80.
- [15] Hou J, 2019, The Transformation of Oral English Teaching Mode in the Era of Artificial Intelligence. *Teaching and Administration*, 2019(33): 86–88.

Publisher's note

Bio-Byword Scientific Publishing remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Research on Factors Influencing University Students' Continuance Intention to Use Generative Artificial Intelligence

Yue Zhang*

Party Committee Office of Jiangsu University, Jiangsu 212013, Zhenjiang, China

**Author to whom correspondence should be addressed.*

Copyright: © 2025 Author(s). This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0), permitting distribution and reproduction in any medium, provided the original work is cited.

Abstract: To investigate university students' continuance intention regarding the use of generative artificial intelligence (Gen AI) in academic paper writing and to promote the sustained and healthy development of Gen AI, this study constructs a model of factors driving university students' continuance intention towards Gen AI. The study integrates the Stimulus-Organism-Response (SOR) framework and the Technology Acceptance Model (TAM). Valid data from 397 questionnaires were collected and analyzed using Smart-PLS software to test the theoretical model. The findings reveal that perceived usefulness, satisfaction, and subjective norms are the primary factors influencing university students' continuance intention to use Gen AI. Furthermore, perceived usefulness, perceived ease of use, and perceived risk are identified as the main factors affecting university students' satisfaction with leveraging Gen AI.

Keywords: Generative artificial intelligence; Continuance intention; Paper writing; Stimulus-organism-response framework; Technology acceptance model

Online publication: September 18, 2025

1. Introduction

Generative artificial intelligence (Gen AI), represented by ChatGPT, has brought unprecedented, profound transformations to fields such as teaching and learning due to its powerful data analysis and model generation capabilities ^[1]. Within academic paper writing, Gen AI has been widely adopted and applied ^[2]. This research constructs a model to study university students' continuance intention towards adopting Gen AI, specifically from the perspective of paper writing, to provide reference and guidance for the scientific and standardized use of Gen AI by university students in their academic writing endeavors.

2. Theoretical foundation

2.1. Stimulus-organism-response framework

The stimulus-organism-response (S-O-R) framework was derived by Woodworth from stimulus-response theory, emphasizing the subjective role of the organism^[3]. This framework has been widely applied in studies on users' continuance intention. Wentao Wang et al. explored the impact of changes in user experience on continuance intention in social media based on an extended S-O-R framework^[4]. Hongcan Zhu et al. integrated flow experience with the S-O-R framework, demonstrating the influence of functional attributes, social attributes, and perceived privacy on continuance intention^[5]. Therefore, this study constructs a structural equation model from the three dimensions of stimulus, organism, and response, providing a fundamental theoretical framework for the research.

2.2. Technology acceptance model

The technology acceptance model (TAM), proposed by Davis in 1989, explains and predicts users' acceptance and usage behavior of information technology^[6]. TAM has been extensively applied in research on users' information technology usage behavior. Hong et al. confirmed that TAM has strong explanatory power for continuance usage behavior^[7]. Premkumar et al. found that perceived usefulness significantly influences users' attitudes and actual usage behavior^[8]. Thong et al. discovered that users' perception of ease of use affects their initial expectations and subsequent usage intention^[9]. Bhattacharjee demonstrated that satisfaction has a significant positive impact on users' continuance intention^[10]. When explaining users' intention in complex environments, reorganizing and adjusting the influencing factors in TAM can effectively address issues of low reliability and validity^[11]. Therefore, this study combines TAM with the S-O-R framework while further introducing perceived risk and subjective norm variables to achieve a more robust model.

2.3. Perceived risk theory

Perceived risk theory (PRT), proposed by Bauer in 1960, analyzes the impact of uncertain outcomes on consumer behavior. With technological advancements and interdisciplinary integration, PRT has gradually been applied in communication, management, and economics^[12]. Chi et al. found that privacy risk exerts the strongest negative influence on users' usage intention^[13]. Yali Liu et al. revealed that users' risk perception affects their usage intention, particularly as perceived privacy risk intensifies negative states, thereby leading to continuance intention^[14]. As a new generation of AI technology, Gen AI is characterized by radicalness, uncertainty, and ambiguity, which may lead users to perceive risks during usage^[15]. Thus, incorporating perceived risk into the research framework enables a more objective and accurate understanding of the relationships among factors shaping university students' continuance intention.

2.4. Subjective norm

The concept of subjective norm first appeared in Ajzen and Fishbein's Theory of Reasoned Action (TRA), referring to an individual's perception of significant others' expectations regarding specific behaviors and their willingness to comply, primarily encompassing perceived social pressure and social expectation dynamics^[16]. Ajzen further refined subjective norm in the Theory of Planned Behavior (TPB), listing it as one of three core variables explaining behavioral intention^[17]. Venkatesh expanded subjective norm into social influence in the Unified Theory of Acceptance and Use of Technology (UTAUT)^[18]. In continuance intention research, Chunhui Tan et al. confirmed that subjective norm exerts the most significant influence on users' continuance

intention^[19]. Therefore, introducing subjective norm as a supplementary variable helps better identify and explain the influence of external factors such as significant others.

3. Research hypotheses and model construction

3.1. Perceived usefulness

Perceived usefulness refers to university students' belief that using Gen AI in paper writing can improve paper quality and enhance writing efficiency. In the expectation-confirmation model, Bhattacharjee demonstrated that user expectations significantly and positively influence perceived usefulness^[10]. Chunhui Tan et al. confirmed the significant positive effects of user expectations and information quality on perceived usefulness, with these factors indirectly affecting satisfaction through perceived usefulness^[20]. In the context of paper writing, user expectations reflect the alignment between students' writing needs and Gen AI-provided information. Information quality refers to the quality of content students obtain via Gen AI, while economic efficiency indicates effective reductions in time and financial costs through Gen AI usage. Thus, the following hypotheses are proposed:

H1: User expectations have a significant positive effect on university students' perceived usefulness of Gen AI.

H2: Information quality has a significant positive effect on university students' perceived usefulness of Gen AI.

H3: Economic efficiency has a significant positive effect on university students' perceived usefulness of Gen AI.

Perceived ease of use significantly and positively influences perceived usefulness^[6]. When students find Gen AI's interface user-friendly, operation convenient, and information easily accessible, they are more likely to perceive higher usefulness. Thus, the following hypotheses are proposed:

H4: Perceived ease of use has a significant positive effect on university students' perceived usefulness of Gen AI.

3.2. Perceived ease of use

Perceived ease of use refers to university students' perception that utilizing Gen AI for paper writing is effortless. Jianxia Li et al. verified that platform features and information supply significantly and positively affect users' perceived ease of use^[21]. Jinfen Xu et al. confirmed that self-efficacy significantly and positively influences perceived ease of use^[22]. Fan Zhe et al. demonstrated the significant positive effects of platform quality and self-efficacy on perceived ease of use^[23]. For academic paper writing, application features encompass students' perception of how Gen AI's functional design, interface, and technical performance facilitate ease of use. Self-efficacy reflects students' confidence in their ability to use Gen AI for paper writing. Information supply refers to Gen AI's capacity to provide accurate, authoritative, comprehensive, and academically compliant content. Thus, the following hypotheses are proposed:

H5: Application features have a significant positive effect on university students' perceived ease of use of Gen AI.

H6: Self-efficacy has a significant positive effect on university students' perceived ease of use of Gen AI.

H7: Information supply has a significant positive effect on university students' perceived ease of use of

Gen AI.

3.3. Perceived risk

Perceived risk refers to university students' assessment of potential negative consequences when using generative artificial intelligence (Gen AI) for academic writing. Wang et al. found that privacy risk significantly and positively influences perceived risk^[24]. Yali Liu et al. identified time-related and ethical risks as key dimensions shaping users' risk perception toward Gen AI^[14]. In academic writing scenarios, privacy risk reflects students' concerns about unauthorized use, leakage, or misuse of personal data or paper content, along with resultant negative impacts. Time risk denotes perceived inefficiency or time wastage when leveraging Gen AI. Ethical risk involves potential violations of social norms or personal values through Gen AI usage. Thus, the following hypotheses are proposed:

H8: Privacy risk has a significant positive effect on university students' perceived risk of Gen AI.

H9: Time risk has a significant positive effect on university students' perceived risk of Gen AI.

H10: Ethical risk has a significant positive effect on university students' perceived risk of Gen AI.

3.4. Satisfaction

Satisfaction represents the positive affective state derived from leveraging Gen AI for academic writing. Huang et al. demonstrated that perceived usefulness and ease of use most significantly influence positive affect^[25]. Shahrabani et al. revealed that perceived risk substantially affects attitudes, where higher risk perception correlates with more negative attitudes^[26]. Thus, the following hypotheses are proposed:

H11: Perceived usefulness has a significant positive effect on university students' satisfaction with Gen AI.

H12: Perceived ease of use has a significant positive effect on university students' satisfaction with Gen AI.

H13: Perceived risk has a significant negative effect on university students' satisfaction with Gen AI.

3.5. Continuance intention

Continuance intention refers to students' willingness to persistently use or recommend Gen AI for academic writing. The positive effects of perceived usefulness and satisfaction on continuance intention have been empirically validated. Zhou et al. confirmed the significant impact of perceived usefulness on behavioral intention^[27]. Hong et al. identified satisfaction as a critical determinant of continuance usage^[7]. Within academic writing contexts, subjective norm captures social expectations and pressures from significant others regarding Gen AI usage. Both the Theory of Planned Behavior and Unified Theory of Acceptance and Use of Technology empirically validate their influence on usage intention^[18, 28]. Thus, the following hypotheses are proposed:

H14: Perceived usefulness has a significant positive effect on university students' continuance intention to use Gen AI.

H15: Satisfaction has a significant positive effect on university students' continuance intention to use Gen AI.

H16: Subjective norm has a significant positive effect on university students' continuance intention to use Gen AI.

Building upon the Stimulus-Organism-Response Framework and Technology Acceptance Model, this

study develops a research model (**Figure 1**) to examine factors shaping university students' continuance intention toward Gen AI in academic writing contexts.

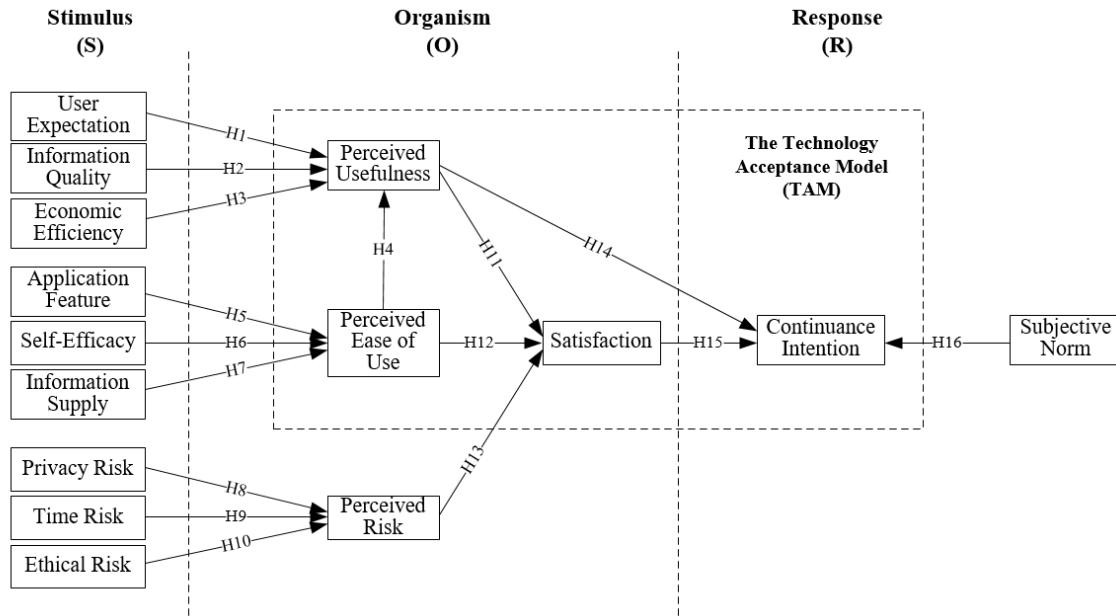


Figure 1. Research model of university students' continuance intention toward Gen AI

4. Research design and data processing

4.1. Questionnaire design

The questionnaire was developed based on established instruments, consisting of two parts: basic information and variable measurement, totaling 49 items. The measurement section employed a 5-point Likert scale. Table 1 presents the measurement items and relevant sources.

Table 1. Measurement scale for factors influencing university students' continuance intention toward Gen AI

Latent variable	Measurement items	Reference sources
User Expectation (UE)	UE1: I think my experience and gains from Gen AI exceeded my expectations UE2: I think the quality of content generated by Gen AI exceeded my expectations UE3: I think the functional level of Gen AI exceeded my expectations	[24]
Information Quality (IQ)	IQ1: I think the information provided by Gen AI is authentic and reliable IQ2: I think the information provided by Gen AI demonstrates strong theoretical professionalism IQ3: I think the information generated by Gen AI is highly relevant to academic research	[20]
Economic Efficiency (EE)	EE1: I think Gen AI to be cost-effective EE2: I think Gen AI can reduce my paper writing costs EE3: I think Gen AI is more convenient than other paper writing assistance methods EE4: I think Gen AI provides more comprehensive content than other assistance methods	[29, 30]

Table 1 (Continued)

Latent variable	Measurement items	Reference sources
Application Feature (AF)	AF1: I think Gen AI responses is very quick AF2: I think Gen AI is easy to operate and use AF3: I think the interface design of Gen AI is very user-friendly	[21–22]
Self-Efficacy (SE)	SE1: I believe I can independently use and master Gen AI SE2: I think I can solve problems encountered during usage SE3: I believe I can use various Gen AI tools	[24]
Information Supply (IS)	IS1: I think the information provided by Gen AI is standardized and authoritative IS2: I think the sources of information provided by Gen AI are accurate IS3: I think the information descriptions provided by Gen AI are correct and complete	[22]
Privacy Risk (PR)	PR1: I think Gen AI excessively collects my personal information without my knowledge PR2: I think my personal information has been leaked PR3: I feel service providers are inappropriately using my personal information	[31–32]
Time Risk (TR)	TR1: Installing and learning to use Gen AI took considerable time TR2: I need to continuously follow Gen AI developments to ensure continued usage TR3: I spend time verifying the accuracy of content generated by Gen AI	[31]
Ethical Risk (ER)	ER1: I think research institutions and governments haven't established effective measures for AI ethical risk control ER2: I think adopting Gen AI for paper writing constitutes academic misconduct	[25]
Satisfaction (S)	S1: I'm very interested in Gen AI S2: Using Gen AI makes me happy S3: I'm satisfied with my decision to use Gen AI	[26]
Perceived Usefulness (PU)	PU1: I think Gen AI helps me complete paper writing PU2: I think utilizing Gen AI for paper writing meets my expectations PU3: I think utilizing Gen AI improves my writing efficiency	[21, 24]
Perceived Ease of Use (PEOU)	PEOU1: Learning to use Gen AI for paper writing is very easy PEOU2: I'm proficient in adopting Gen AI for paper writing PEOU3: Papers generated by AI are easily understandable	[21, 27]
Perceived Risk (PRQ)	PRQ1: I feel uneasy adopting Gen AI for paper writing PRQ2: I think adopting Gen AI for paper writing brings uncertain risks PRQ3: I think adopting Gen AI for paper writing is risky	[26, 32]
Subjective Norm (SN)	SN1: I think important people (tutors/friends/family) expect me to use Gen AI for paper writing SN2: I think important people want me to continue leveraging Gen AI for paper writing SN3: I care about others' opinions regarding my use of Gen AI for paper writing	[16]
Continuance Intention (CI)	CI1: I will continue leveraging Gen AI for paper writing CI2: I will frequently use Gen AI for paper writing in the future CI3: I will recommend others to use Gen AI for paper writing	[10]

4.2. Data collection

The study distributed questionnaires through online platforms, collecting 397 valid responses. Subsequently, statistical analysis of the sample data was conducted using SPSS, with results presented in **Table 2**.

Table 2. Demographic statistics

Category	Option	Frequency	Percentage
Gender	Female	154	38.79
	Male	243	61.21
Education	Bachelor	216	54.41
	Master	158	39.80
	Doctorate	23	5.79
	Education	24	6.04
Discipline	Science	50	12.59
	Engineering	255	64.23
	Management	43	10.83
	Others	25	6.30

4.3. Reliability and validity analysis

The study employed Smart-PLS software to conduct reliability and validity tests on the sample data, with the results presented in **Tables 3** and **4**. The analysis demonstrates strong reliability of the results, with the model data exhibiting high convergent validity. The internal correlations among variables meet established standards, and the discriminant validity between variables is satisfactory.

Table 3. Reliability and convergent validity test results of the sample data

Latent variable	Measurement items	Factor loading coefficients	Cronbach's α	CR	AVE
User Expectation (UE)	UE1	0.866	0.805	0.885	0.719
	UE2	0.858			
	UE3	0.819			
Information Quality(IQ)	IQ1	0.858	0.788	0.876	0.702
	IQ2	0.814			
	IQ3	0.841			
Economic Efficiency (EE)	EE1	0.756	0.835	0.887	0.664
	EE2	0.84			
	EE3	0.821			
	EE4	0.839			
Application Feature (AF)	AF1	0.876	0.828	0.897	0.744
	AF2	0.859			
	AF3	0.852			

Table 3 (Continued)

Latent variable	Measurement items	Factor loading coefficients	Cronbach's α	CR	AVE
Self-Efficacy (SE)	SE1	0.882	0.791	0.877	0.704
	SE2	0.77			
	SE3	0.862			
Information Supply (IS)	IS1	0.873	0.843	0.905	0.762
	IS2	0.858			
	IS3	0.888			
Privacy Risk (PR)	PR1	0.872	0.857	0.913	0.778
	PR2	0.907			
	PR3	0.867			
Time Risk (TR)	TR1	0.763	0.745	0.854	0.662
	TR2	0.835			
	TR3	0.84			
Ethical Risk (ER)	ER1	0.917	0.805	0.911	0.837
	ER2	0.912			
Satisfaction(S)	S1	0.875	0.775	0.87	0.69
	S2	0.793			
	S3	0.822			
Perceived Usefulness (PU)	PU1	0.881	0.828	0.897	0.744
	PU2	0.872			
	PU3	0.835			
Perceived Ease of Use (PEOU)	PEOU1	0.843	0.772	0.868	0.687
	PEOU2	0.814			
	PEOU3	0.83			
Perceived Risk (PRQ)	PR1	0.858	0.842	0.905	0.76
	PR2	0.875			
	PR3	0.883			
Subjective Norm (SN)	SN1	0.893	0.774	0.869	0.691
	SN2	0.883			
	SN3	0.705			
Continuance Intention (CI)	CI1	0.874	0.813	0.889	0.728
	CI2	0.86			
	CI3	0.825			

Table 4. Discriminant validity test results of the sample data

	SN	ER	IS	IQ	AF	PEOU	PU	PRQ	CI	TR	S	UE	EE	SE	PR
SN	0.831														
ER	0.005	0.915													
IS	0.354	0.029	0.873												
IQ	0.283	0.073	0.437	0.838											
AF	0.270	0.018	0.458	0.346	0.862										
PEOU	0.288	0.043	0.534	0.327	0.486	0.829									
PU	0.377	0.032	0.571	0.544	0.484	0.600	0.863								
PRQ	0.073	0.360	-0.211	0.157	0.216	-0.306	0.359	0.872							
CI	0.622	0.052	0.406	0.368	0.338	0.522	0.624	0.252	0.853						
TR	0.079	0.370	0.079	0.034	0.044	-0.092	0.058	0.303	0.154	0.813					
S	0.262	0.035	0.392	0.325	0.282	0.552	0.619	0.367	0.544	0.003	0.831				
UE	0.081	0.086	0.201	0.305	0.179	0.081	0.257	0.001	0.172	0.071	0.175	0.848			
EE	0.135	0.041	0.347	0.467	0.320	0.282	0.516	0.299	0.389	0.039	0.412	0.367	0.815		
SE	0.266	0.120	0.528	0.315	0.455	0.538	0.425	0.168	0.354	0.072	0.365	0.175	0.340	0.839	
PR	0.128	0.307	0.039	0.021	0.021	-0.064	0.029	0.445	0.011	0.447	0.048	0.030	0.105	0.006	0.882

4.4. Model fit and hypothesis testing

Using Smart-PLS software with the Bootstrapping algorithm (5,000 resamples), the path coefficients, *t*-values, F^2 , significance levels (*P*-values), and hypothesis testing results are summarized in Table 5. The results indicate that the endogenous variables demonstrate strong explanatory power, the model exhibits good goodness-of-fit, and all hypotheses were supported except for H1 and H9.

Table 5. Path coefficient test results

Hypotheses	Path	Path coefficients	t-values	F2	P-values	Test results
H1	UE→PU	0.047	1.017	0.004	0.309	Not Supported
H2	IQ→PU	0.270	4.837	0.116	0***	Supported
H3	EE→PU	0.250	4.427	0.098	0***	Supported
H4	PEOU→PU	0.437	8.269	0.368	0***	Supported
H5	AF→PEOU	0.228	3.776	0.064	0***	Supported
H6	SE→PEOU	0.287	5.138	0.093	0***	Supported
H7	IS→PEOU	0.278	5.322	0.087	0***	Supported
H8	PR→PRQ	0.346	5.961	0.125	0***	Supported
H9	TR→PRQ	0.063	1.067	0.004	0.286	Not Supported
H10	ER→PRQ	0.230	4.243	0.060	0***	Supported
H11	PU→S	0.412	6.376	0.188	0***	Supported
H12	PEOU→S	0.262	4.449	0.079	0***	Supported
H13	PRQ→S	-0.139	3.588	0.030	0***	Supported
H14	PU→CI	0.311	4.759	0.137	0***	Supported
H15	S→CI	0.235	3.596	0.085	0***	Supported
H16	SN→CI	0.443	9.464	0.419	0***	Supported

Note: *** indicates $P < 0.001$

5. Conclusions and recommendations

5.1. Conclusions

Perceived usefulness, satisfaction, and subjective norms emerged as primary factors driving university students' continuance intention to use Gen AI. Study results show that subjective norms exhibited the most significant impact, which indicates that social approval from significant others strongly motivates sustained usage. Both perceived usefulness and satisfaction positively affected continuance intention, confirming that utility perceptions and positive affective states drive adoption persistence.

Satisfaction was predominantly shaped by perceived usefulness, perceived ease of use, and perceived risk. Results reveal that perceived usefulness and ease of use exhibit significant positive effects on satisfaction, with perceived usefulness demonstrating the strongest influence. This indicates that students develop more positive affective responses when they explicitly recognize Gen AI's effectiveness in supporting academic writing. Conversely, perceived risk shows a significant negative effect on satisfaction, meaning heightened risk perception during Gen AI usage correlates with increased negative affect toward the application. Additionally, the hypothesis that user expectations would affect perceived usefulness was not supported, indicating that pre-usage expectations do not significantly influence students' perception of Gen AI's utility. The hypothesis that time risk influences perceived risk is also not supported, suggesting that the efficiency of time usage does not significantly affect students' perception of the risks associated with Gen AI.

5.2. Recommendations

For generative AI developers and operators, satisfaction, perceived usefulness, and subjective norm exert significant and direct effects on users' continuance intention. First, developers and operators should continuously optimize user experience to enhance satisfaction—particularly regarding perceived usefulness and ease of use—by actively addressing user feedback, refining product functionalities, and improving interface friendliness to prevent user churn. Second, product usefulness must be prioritized, with generated content quality as the core offering. Continuous improvement of output quality is essential to elevate users' perceived usefulness. Finally, developers should collaborate proactively with regulatory authorities to establish usage guidelines, ensuring generative AI amplifies academic value in paper writing rather than becoming synonymous with academic misconduct.

For higher education administrators, guidance should be provided to ensure students' appropriate and ethical use of Gen AI in academic writing, preventing over-reliance and academic misconduct. While Gen AI undeniably offers tangible efficiency benefits in scholarly writing, educational administrators must leverage its instrumental role through general courses and academic workshops that disseminate standardized application methodologies for research. Concurrently, it is necessary to develop robust usage guidelines for Gen AI, create a positive academic atmosphere, and avoid excessive dependence and academic misconduct.

Funding

This study constitutes phased research outcomes of the 2022 Philosophy and Social Sciences Research Project for Higher Education Institutions “Research on Synergistic Education Pathways Integrating Labor Education and Innovation-Entrepreneurship Education in Universities during the New Era” (Project No: 2022SJSZ1174) and the 2024 Jiangsu University Higher Education Planning and Development Research Project “Research on the Cultivation Model of Top-notch Innovative Talents in Local High-Level Universities from the Perspective

of Education-Science-Technology-Talent Integration” (Project No.: G202406).

Disclosure statement

The author declares no conflict of interest.

References

- [1] Wang YM, Wang XY, Liu CC, 2024, Research on Ethical Risk Management Framework for Generative Artificial Intelligence Application in Education. *E-education Research*, 45(10): 28–34 + 42.
- [2] Chu JW, Du XX, 2024, Research Review of Generative Artificial Intelligence Empowering Knowledge Production in Scientific Research. *Journal of Academic Libraries*, 42(3): 108–117.
- [3] Woodworth RS, 1926, Dynamic psychology. *The Pedagogical Seminary and Journal of Genetic Psychology*, 33(1): 103–118.
- [4] Wang WT, Qian PB, Ding YC, et al., 2023, The Impact of Personalized Content Recommendation Close on Continuous Use Intention of Mobile Social Media. *Library and Information Service*, 67(11): 88–100.
- [5] Zhu HC, Hu X, Wang XB, 2018, The User’s Continuance Use Intention of Government Data Open Platform based on the S-O-R Framework. *Journal of Modern Information*, 38(5): 100–105 + 116.
- [6] Davis FD, 1989, Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. *Management Information Systems Quarterly*, 13(3): 319–340.
- [7] Hong SJ, Thong JYL, Tam KY, 2006, Understanding Continued Information Technology Usage Behavior: A Comparison of Three Models in the Context of Mobile Internet. *Decision Support Systems*, 42(3): 1819–1834.
- [8] Premkumar G, Bhattacharjee A, 2005, Explaining Information Technology Usage: A Test of Competing Models. *Omega*, 36(1): 64–75.
- [9] Thong JYL, Hong SJ, Tam KY, 2006, The Effects of Post-adoption Beliefs on the Expectation-confirmation Model for Information Technology Continuance [J]. *International Journal of Human-Computer Studies*, 64(9): 799–810.
- [10] Bhattacharjee A, 2001, Understanding Information Systems Continuance: An Expectation-Confirmation Model. *MIS Quarterly*, 25(3): 351–370.
- [11] Qin HX, Li Z, Zhou JH, 2020, A Probe into the Satisfaction with Online Teaching of Different Subjects and the Willingness to Continue Using It—An Empirical Analysis Based on the Technology Acceptance Model. *Educational Research*, 41(11): 91–103.
- [12] Zhang YH, Yuan QJ, Shen HZ, 2022, Perceived Risk Theory and Its Application and Prospect in the Field of Information System Research. *Journal of Modern Information*, 42(5): 149–159.
- [13] Chi H, Yeh H, Hung W, 2012, The Moderating Effect of Subjective Norm on Cloud Computing Users’ Perceived Risk and Usage Intention. *International Journal of Marketing Studies*, 4(6): 95.
- [14] Liu YL, Fan FC, 2024, ChatGPT-AIGC Users Risk Perception Dimension Identification and Management Research: An Exploratory Analysis Based on Grounded Theory. *Information Studies: Theory & Application*, 47(3): 121–129.
- [15] Sun D, Xue L, Zhang LP, 2021, Social Contagion of Emerging Technologies Risk Perception Based on “Coupling-Evolution” Process. *Studies in Science of Science*, 39(1): 2–11
- [16] Ajzen I, Fishbein M, 1972, Attitudes and Normative Beliefs as Factors Influencing Behavioral Intentions. *Journal of Personality & Social Psychology*, 21(1): 1–9.

- [17] Ajzen IU, 1991, The Theory of Planned Behavior. *Organizational Behavior and Human Decision Processes*, 50(2): 179–211.
- [18] Venkatesh V, Morris GM, Davis BG, et al., 2003, User Acceptance of Information Technology: Toward a Unified View. *MIS Quarterly*, 27(3): 425–478.
- [19] Tan CH, Li Y, 2020, Research on Influencing Factors of Users' Continuous Usage Intention of Virtual Academic Community. *Research on Library Science*, 2020(20): 28–38.
- [20] Tan CH, Yi Y, Li L, 2021, Research on the Influential Factors of Users' Continuance Intention Towards Academic WeChat Public Account. *Journal of Modern Information*, 41(1): 50–59 + 77.
- [21] Li JX, Yu DD, 2023, Analysis on Perceived Usefulness of Users of Scientific Data Sharing Platform. *Journal of Intelligence*, 42(9): 196–201.
- [22] Xu JF, Deng QL, 2024, Chinese EFL Learners' Acceptance of Live Video-streamed Teaching Platforms: A Study Based on the Technology Acceptance Model. *Foreign Language Teaching and Research*, 56(2): 262–273 + 320–321.
- [23] Fan Z, Liu YL, 2020, Impact of Perceived Usefulness and Ease of Use on User Mobile Visual Search Behavior Intention. *Information and Documentation Services*, 41(1): 79–86.
- [24] Wang X, McGill JT, Klobas EJ, 2020, I Want It Anyway: Consumer Perceptions of Smart Home Devices. *The Journal of Computer Information Systems*, 60(5): 437–447.
- [25] Huang YM, Lou SJ, Hong TC, et al., 2019, Middle-aged Adults' Attitudes Toward Health App Usage: A Comparison with the Cognitive-affective-conative Model. *Universal Access in the Information Society*, 18(4): 927–938.
- [26] Shahrabani S, Rosenboim M, Shavit T, et al., 2019, Should I Stay or Should I Go?" Risk Perceptions, Emotions, and the Decision to Stay in an Attacked Area. *International Journal of Stress Management*, 26(1): 57–64.
- [27] Zhou M, Zhao L, Kong N, et al., 2019, Factors Influencing Behavior Intentions to Telehealth by Chinese Elderly: An Extended TAM Model. *International Journal of Medical Informatics*, 2019(126): 118–127.
- [28] Kelman CH, 2006, Interests, Relationships, Identities: Three Central Issues for Individuals and Groups in Negotiating Their Social Environment. *Annual Review of Psychology*, 57(1): 21–26.
- [29] Jayasingh S, Eze CU, 2010, The Role of Moderating Factors in Mobile Coupon Adoption: An Extended TAM Perspective. *Communications of the IBIMA*, 2010(596470): 1.
- [30] Lu D, Zheng XQ, 2022, Tourists' Psychological Mechanism in Sharing Accommodation: A Cognition-emotion-action Theory Perspective. *Resource Development & Market*, 38(11): 1382–1389 + 1400.
- [31] Jiang ZW, 2023, Construction of Influencing Factors Model for Privacy Risk Perception in Human-Machine Interaction—Empirical Research Based on User Use of Smart Speaker. *Journalism and Mass Communication*, 2023(8): 83–96.
- [32] Song Y, Chen L, Li Q, et al., 2022, AI Ethical Risk Perception, Trust and Public Participation. *Studies in Science of Science*, 40(7): 1153–1162 + 1171.

Publisher's note

Bio-Byword Scientific Publishing remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Current Status and Implications of Online Autonomous Learning in College English Based on Online Learning Data: A Case Study of Learning Data from the “Lighthouse Reading” Platform

Qiaoling Li*

Chengdu College of Arts and Sciences, Chengdu 610400, Sichuan, China

**Author to whom correspondence should be addressed.*

Copyright: © 2025 Author(s). This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0), permitting distribution and reproduction in any medium, provided the original work is cited.

Abstract: With the deepening advancement of educational informatization and the advent of the 2.0 era, online autonomous learning has become an important component of college English teaching and a key breakthrough in its reform. Based on the Self-Determination Theory and Self-Regulated Learning Theory, this study analyzes the learning data from the “Lighthouse Reading” platform in the first half of 2025 at a university to examine the current status of college students’ online autonomous learning in English. The results reveal a significant polarization in students’ online learning, reflected not only in learning duration and task completion rates but also in the differences in learners’ self-regulation abilities. Additionally, the study finds that learning engagement and outcomes are positively correlated, but nonlinear—mere time investment does not guarantee learning quality, as the key lies in the application of effective metacognitive strategies for deep learning. These findings provide important theoretical foundations and practical guidance for optimizing college English online teaching models.

Keywords: Online autonomous learning; College English; Learning behavior analysis; Teaching reform

Online publication: September 18, 2025

1. Introduction

Against the backdrop of the deep integration of information technology and education and the digital transformation, online autonomous learning platforms, as a valuable supplement to traditional classroom teaching, break through temporal and spatial constraints, meet students’ personalized learning needs, and offer new possibilities for college English teaching, reshaping its pedagogical ecosystem. However, in practice, students’ online learning outcomes vary significantly. By analyzing real learning data from the “Lighthouse Reading” platform, this study aims to reveal the current state of college learners’ autonomy in online

English learning and provide data-driven support and improvement suggestions ^[1-2]. The Self-Determination Theory emphasizes the internalization of learning motivation, proposing that the satisfaction of three basic psychological needs—autonomy, competence, and relatedness—is key to stimulating intrinsic motivation ^[3]. Zimmerman’s Self-Regulated Learning Theory suggests that successful learners often exhibit stronger abilities in goal setting, strategy selection, and self-monitoring ^[4]. The integration of these theoretical perspectives provides a multidimensional foundation for analyzing the “Lighthouse Reading” platform data.

2. Research on student autonomy in foreign language teaching

The cultivation of college students’ online autonomous learning ability in English has become a core objective of teaching reform, with its theoretical roots in the constructivist perspective of learners’ active construction of knowledge ^[5]. Existing research indicates that fostering students’ autonomous learning ability is a requirement of quality education and lifelong learning. College English is well-suited for autonomous learning, and the cultivation of such ability is crucial in higher education. However, autonomous learning requires teacher guidance, and educators should adhere to principles such as inquiry-based learning and routinization to stimulate student autonomy from four aspects: motivation, goals, etc. ^[6]. This necessitates a shift in the teacher’s role from knowledge transmitter to facilitator, fostering students’ autonomous awareness through metacognitive strategy training, task-based activity design, and formative assessment ^[7]. Blended learning, combining traditional and online learning advantages, can reflect student-centeredness. Related research has also explored its role in promoting autonomy in academic English learning, using a model of “autonomous learning + classroom teaching + online interaction” to enhance student abilities and cultivate international talents ^[6]. Furthermore, scholars have noted that in academic English teaching, teachers can leverage online resources and technology to help students master communication methods and improve comprehensive application skills ^[8]. Empirical studies show that online platforms can increase students’ goal-setting ability by 40% and self-monitoring rates by 65% ^[9]. Moreover, Challenges such as students’ initial dependence and platform functional limitations are prominent ^[7]. Current research gaps focus on the extent of teacher intervention in blended learning, optimization of platform interactivity, and long-term evaluation mechanisms, providing theoretical entry points and practical references for analyzing the current status of online autonomous learning based on “Lighthouse Reading” data. However, while these studies reveal the developmental paths and challenges of online autonomous learning, few delve into the dynamic practice of student autonomy based on real learning behavior data. This study leverages the massive learning logs and interaction records of the “Lighthouse Reading” platform to quantitatively analyze students’ behavioral trajectories in core areas such as goal setting, strategy selection, and process monitoring, aiming to reveal the true landscape of college English online autonomous learning and offer data-driven solutions to key issues like “difficulty in strategy implementation” and “weak platform adaptability.”

3. Data analysis and current status

An in-depth analysis of the “Lighthouse Reading” platform data reveals distinct patterns in college students’ online English learning behaviors, presenting a complex landscape. Firstly, there exists significant polarization in student engagement levels. While some learners demonstrate exceptionally high participation with cumulative study durations exceeding 1,000 minutes, others show minimal involvement (less than 10 minutes) or complete non-participation. This disparity manifests not only in absolute time investment but more critically in the

consistency and sustainability of learning behaviors. The data indicate a pronounced “last-minute cramming” phenomenon, where platform activity remains low during early semester periods but surges significantly as midterm and final assessments approach. Notably, students maintaining regular study routines consistently outperform their cramming counterparts in learning outcomes, suggesting that such emergency learning patterns are detrimental to long-term knowledge retention and language proficiency development.

Secondly, regarding learning outcomes and task completion, while greater time investment generally correlates with better performance, this relationship is not absolute. A subset of students dedicates substantial time yet achieves suboptimal results, indicating that temporal commitment alone cannot guarantee learning quality; study methods and efficiency prove equally crucial. The platform data reveal a stratified distribution of reading task completion: approximately 35% of students exceed requirements (typically scoring above 95), 45% meet basic standards (scoring 80-95), while 20% complete less than half of tasks (mostly failing). Among task-completers, outcome differentials primarily reflect quality rather than quantity of engagement, with high-quality performers demonstrating markedly superior comprehension depth and language application skills compared to superficial participants.

Furthermore, students employing elaboration strategies that facilitate connections between new and prior knowledge significantly outperform peers relying on surface-level learning approaches ^[10]. The platform’s data analytics identify characteristic forgetting curves among learners, prompting critical reconsideration of online activity design and scheduling. Additionally, the absence of meaningful interaction mechanisms in the virtual learning environment may constrain cognitive development for certain learners, explaining why mere quantitative increases in reading volume fail to produce commensurate gains in language competence.

4. Existing problems

Current online autonomous learning in college English faces multifaceted challenges. Empirical data reveal that approximately 15% of students exhibit negative attitudes toward online learning, typically manifesting as passive compliance or complete non-participation. In-depth analysis identifies the absence of clear learning objectives and intrinsic motivation as primary causative factors. From the perspective of Self-Determination Theory, when the learning environment fails to satisfy students’ three fundamental psychological needs — autonomy, competence, and relatedness — motivation deterioration becomes inevitable ^[3]. The 15% disengaged learner cohort in the platform data essentially represents this motivational predicament.

Regarding learning plan implementation and self-regulation, while many students establish study plans, consistent execution proves challenging. Platform analytics demonstrate discontinuous and arbitrary learning patterns characterized by inadequate sustainability and systematicity, particularly evident in the absence of direct teacher supervision, where self-discipline markedly declines. In terms of learning methodologies and cognitive strategies, substantial time investment by some students yields disproportionately limited outcomes, indicating suboptimal learning approaches. Common inefficient practices include mechanical repetition exercises, superficial reading engagement, and neglect of reflective summarization, and these maladaptive strategies significantly compromise learning efficacy.

5. Implications and suggestions

5.1. Construct a multi-dimensional evaluation and incentive system to boost motivation

Establish a comprehensive evaluation system incorporating both process and outcome assessments. Integrate

online learning performance—such as learning duration, task completion rates, learning quality, and interaction participation—into course evaluations, moving beyond the traditional reliance on final exam scores. This approach provides a more holistic and objective reflection of students’ learning processes and efforts. Implement phased reward mechanisms, offering points, badges, or course bonuses for achieving phased learning goals to motivate students. Showcase exemplary learning cases, such as sharing high achievers’ notes, plans, and insights, to inspire others and foster a positive learning atmosphere. This design draws on formative assessment theory, using timely feedback and incentives to help students establish clear learning paths and directions.

5.2. Strengthen learning method guidance to enhance competence

Teachers should prioritize teaching effective learning strategies through online workshops, guides, and lectures. For example, in deep reading, instruct students on identifying main ideas, analyzing paragraph structures, and understanding complex sentences. For vocabulary retention, introduce methods like root-affix analysis, contextual memorization, and associative techniques. For autonomous planning, guide students in setting realistic goals, allocating time, and organizing tasks. Such guidance can mitigate inefficient behaviors like rote repetition and shallow reading, enabling students to apply scientific strategies for better outcomes.

5.3. Leverage platform features to optimize learning experiences

Teachers should explore platform functionalities to support learning. Use data analytics and algorithms to personalize learning paths based on students’ proficiency, progress, preferences, and weaknesses, ensuring appropriate challenges for continuous improvement. Display learning progress, completion rates, and goal gaps visually through charts and progress bars to enhance self-monitoring. Provide immediate feedback on exercises or tests, including answers and explanations, and analyze errors to identify weak areas for targeted review. Additionally, create online learning communities for students to exchange insights, share resources, discuss challenges, and collaborate on tasks.

5.4. Adopt blended teaching models for complementary advantages

Combine online autonomous learning with offline classroom instruction in a blended model. Online components focus on foundational skills like vocabulary and grammar, as well as extensive reading, offering abundant resources and flexibility. Offline sessions emphasize discussions, allowing students to share experiences and address challenges, with teachers providing in-depth guidance on common issues. Face-to-face interactions compensate for the lack of emotional and social engagement in purely online environments, enabling teachers to better understand student progress and offer support.

5.5. Optimize instructional design to empower teacher facilitation

At the instructional design level, learning tasks should be structured along a continuum from simple to complex and from foundational to advanced, ensuring students at varying proficiency levels receive appropriate challenges that foster gradual skill development. As facilitators of learning, educators should adopt a scaffolded support approach: when learners encounter difficulties, teachers provide calibrated assistance through strategic prompts, guided questioning, and modeling of problem-solving techniques. This support system follows a diminishing trajectory—as students demonstrate growing competence, instructional scaffolds are systematically faded to promote independent task completion. This pedagogical balancing act achieves optimal equilibrium

between learner autonomy and necessary guidance, thereby maximizing both the teacher's mentoring role and students' agency in the learning process.

6. Conclusion

By analyzing learning data from the Lighthouse Reading" platform and integrating theoretical and empirical insights, this study elucidates the current status of college students' online autonomous learning in English, deepening understanding of this phenomenon. The findings reveal significant individual differences in online learning behaviors, where outcomes depend not only on time investment but also on learning strategies and self-management abilities. These differences essentially reflect variations in learners' self-regulation and cognitive strategy application.

Future teaching reforms should focus on enhancing student motivation, fostering autonomous and metacognitive abilities, and optimizing platform functionalities and learning environment design. While preserving the flexibility of online learning, the social nature of language learning must be considered by increasing interactivity and support, such as strengthening learning communities, to fully realize the potential of online learning.

Disclosure statement

The author declares no conflict of interest.

References

- [1] Dam L, 1995, *Learner Autonomy 3: From Theory to Classroom Practice*. Authentic, Dublin.
- [2] Little D, 1991, *Learner Autonomy: Definition, Issues and Problems*. Authentic, Dublin.
- [3] Ryan RM, Deci EL, 2000, Self-determination Theory and the Facilitation of Intrinsic Motivation, Social Development, and Well-Being. *The American Psychologist*, 55(1): 68–78.
- [4] Zimmerman BJ, Schunk DH, 2001, *Self-regulated Learning and Academic Achievement: Theoretical Perspectives*. Hillsdale, Erlbaum.
- [5] Holec H, 1981, *Autonomy and Foreign Language Learning*. Pergamon Press, Oxford.
- [6] Liang B, 2021, The Role of Teachers in Enhancing College Students' Autonomy in English Learning: Principles and Methods. *Educational Observation*, 10(1): 111–113. <https://doi.org/10.16070/j.cnki.cn45-1388/g4s.2021.01.034>
- [7] Wang XJ, 2013, A Study on Cultivating Learners' Autonomy under the New College English Teaching Model. *Science & Technology Information*, 2013(6): 20.
- [8] Shi H, 2021, A Study on Academic English Learning Autonomy and Promoting Strategies Based on Blended Teaching. *Language and Translation*, 2021(1): 67–72.
- [9] Liu J, 2013, The Role of College English Online Autonomous Learning in Cultivating Learners' Autonomy. *Exam Weekly*, 2013(27): 79–80.
- [10] Flavell, 1979, Metacognition and Cognitive Monitoring: A New Area of Cognitive Developmental Inquiry. *American Psychologist*, 87(34): 901–911.

Publisher's note

Bio-Byword Scientific Publishing remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Research on the Reform of Ideological and Political Education in Preschool Education Major Courses in Colleges and Universities

Linglan Gao*

Fuzhou University of International Studies and Trade, Fuzhou 350202, Fujian, China

**Author to whom correspondence should be addressed.*

Copyright: © 2025 Author(s). This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0), permitting distribution and reproduction in any medium, provided the original work is cited.

Abstract: Colleges and universities' preschool education major is an important place for transporting educational talents to kindergartens or early childhood education institutions. It is rich in ideological and political resources for professional courses. Teachers should adhere to the unity of moral education and professional education, develop ideological and political resources for courses, strengthen the construction of ideological and political courses, organically integrate ideological value guidance with knowledge and skill training, and promote the all-round development of students. Based on this, this paper studies the ideological and political teaching reform of preschool education majors in colleges and universities, deeply analyzes its important value, points out the existing problems, and puts forward targeted reform strategies. The purpose is to improve the quality of ideological and political teaching in the preschool education major, cultivate preschool education professionals with good ideological and political literacy, and inject new vitality into the development of preschool education.

Keywords: Colleges and universities; Preschool education major; Curriculum ideology and politics; Teaching reform

Online publication: September 18, 2025

1. Introduction

As the starting stage of the education system, preschool education plays a crucial foundational role in the growth and development of young children. The quality of talent training in preschool education is directly related to the development level of preschool education. In the context of the new era, strengthening the ideological and political teaching reform of preschool education majors in colleges and universities has far-reaching practical significance^[1]. Curriculum ideology and politics emphasize the organic integration of ideological and political education elements into the teaching of various courses, so as to realize the organic unity of knowledge impartment and value guidance. For the preschool education major, through the ideological and political teaching reform, it can cultivate professionals who not only have solid professional knowledge and skills,

but also have correct ideological and political concepts, noble professional ethics, and humanistic feelings, providing a solid guarantee for the healthy growth of young children. Therefore, it is of great significance to strengthen the ideological and political teaching reform of the preschool education major in colleges and universities.

2. The important value of ideological and political teaching reform in preschool education courses in colleges and universities

2.1. Conducive to promoting correct ideological concepts

The preschool education stage is a critical period for the formation of young children's ideological concepts and values. As guides for children's growth, preschool teachers' own ideological concepts and value orientations have a profound impact on children. Through the reform of ideological and political teaching in courses, colleges, and universities, preschool education majors can guide students to establish correct ideological concepts, enable them to deeply understand the connotation of socialist core values, and integrate them into future educational and teaching practices ^[2]. In professional course teaching, by telling the development history and achievements of China's preschool education cause, students' national pride and sense of responsibility can be enhanced, and their enthusiasm to strive for the preschool education cause can be stimulated. Thus, in future work, they can pass on positive ideological concepts to children and help them "button up the first button of life."

2.2. Conducive to promoting educational innovation

The reform of ideological and political teaching in courses promotes innovation in teaching concepts, teaching contents, and teaching methods in preschool education majors of colleges and universities. In terms of teaching concepts, it has changed from the traditional focus solely on the imparting of professional knowledge to attaching equal importance to knowledge imparting and value guidance, and paying more attention to students' all-round development ^[3]. In terms of teaching content, it deeply explores the ideological and political elements in professional courses, organically integrates ideological and political education with professional knowledge, and enriches the connotation of teaching content. In terms of teaching methods, in order to better achieve the goal of ideological and political education in courses, teachers actively explore diversified teaching methods to improve students' learning interest and participation, and enhance the teaching effect.

2.3. Conducive to improving students' ideological and political literacy

Students majoring in preschool education in colleges and universities will shoulder the responsibility of cultivating young children in the future, and the level of their ideological and political literacy is directly related to the quality of preschool education. Through the reform of ideological and political teaching in courses, students can imperceptibly receive ideological and political education in the process of learning professional courses, and constantly improve their own ideological and political literacy ^[4]. The ideological and political elements in professional courses can guide students to establish a correct professional outlook and educational outlook, make them realize the importance and sacredness of preschool education work, and cultivate their professional dedication and spirit of dedication. Ideological and political teaching in courses focuses on cultivating students' sense of social responsibility, team spirit, and innovative spirit, which are of great significance for students to better communicate and cooperate with children, parents, and colleagues in future preschool education work and carry out educational and teaching activities ^[5].

3. Problems in the ideological and political teaching of preschool education majors in colleges and universities

3.1. The ideological and political content is not closely connected with professional teaching

At present, although some teachers are aware of the importance of ideological and political education in courses, in actual teaching, they fail to deeply explore the ideological and political elements in professional courses, or when integrating ideological and political elements, they appear stiff and forced. They do not organically combine ideological and political education with professional knowledge, making it difficult for students to truly understand and accept the content of ideological and political education. Teachers do not deeply integrate ideological and political content with professional knowledge, teaching cases, etc., in the courses, so that students cannot feel the internal connection between ideological and political education and professional learning, and it is difficult to achieve the expected effect of ideological and political education in courses.

3.2. The teaching mode is relatively single

Some teachers still follow the old path of indoctrination teaching, which emphasizes the dominant position of teachers and students' mastery of knowledge, while ignoring students' dominant position and engagement. There is a lack of classroom interaction and interest, resulting in students' low learning enthusiasm and poor learning effect, and failing to arouse students' in-depth understanding and reflection on ideological and political education. In some professional training courses, teachers pay too much attention to cultivating students' professional skills and fail to make good use of practical teaching to carry out ideological and political education for students. It is difficult for students to realize the importance and practical significance of ideological and political education in the process of practice.

3.3. The teaching evaluation system is not perfect

Teaching evaluation is an important means to test the effect of ideological and political teaching in courses, but at present, the evaluation system of ideological and political teaching in preschool education majors in colleges and universities is not perfect. In the assessment indicators, the emphasis is mainly on professional theories and skills, while the assessment of students' political ideology is relatively insufficient. In addition, due to the lack of assessment standards and standard items, it is difficult to accurately measure the education and growth that students have obtained in the course. At the same time, only teachers conduct the assessment, and there is a lack of participation from external departments such as parents and schools. Such an assessment cannot be comprehensive and fair, and naturally cannot truly reflect the effect of course teaching.

4. Strategies for ideological and political education reform in preschool education courses at colleges and universities

4.1. Optimize content design and strengthen connections with professional practice

The preschool education major boasts abundant resources for ideological and political education. Teachers should enhance the excavation of ideological and political content, integrate it into teaching, help students establish correct educational and child-oriented perspectives, and inspire their professional ideals. First, excavate ideological and political resources in professional theoretical courses. Take Principles of Preschool Education as an example: starting from the laws of children's physical and mental development, this course emphasizes

respecting and appreciating children, embodying the educational concepts of “people-oriented” and “teaching students in accordance with their aptitude.” The course *Preschool Game Theory* highlights the educational value of organizing games in kindergartens, enabling students to implement the concept of happy education in their future work ^[6]. Second, excavate ideological and political resources in professional practical courses. In practical courses, teachers guide students to perceive the professional ethics and dedication of preschool teachers, such as treating children with patience, taking good care of their daily lives, and accurately formulating educational content. Meanwhile, students should be actively encouraged to participate in campus-related activities to practice ideological and political concepts, such as showing concern for children and collaborating with teams ^[7]. Third, excavate ideological and political resources in professional implicit courses. In professional teaching, teachers should demonstrate excellent professional conduct, norms of words and deeds, and personal charisma through their own behaviors. They should also guide students to pay more attention to subtle yet valuable aspects of kindergartens’ daily activities and outdoor activities, such as friendly words between children and adherence to game rules. By capturing entry points for ideological and political education from these aspects, students’ insight and educational sensitivity can be enhanced ^[8].

4.2. Innovate teaching models and optimize educational approaches

In ideological and political education, teachers should focus on innovating teaching models, combining disciplinary characteristics and talent cultivation laws, adopting diverse teaching methods, optimizing educational approaches, and improving the effectiveness of ideological and political teaching. First, enrich classroom teaching methods. Teachers should adhere to student-centeredness, and according to the nature and characteristics of different courses, use diversified teaching methods such as case-based, situational, and experiential approaches to stimulate students’ interest and enthusiasm for learning. For example, in the course *Preschool Educational Psychology*, teachers can adopt case teaching by selecting real cases of children’s psychological development, allowing students to judge the children’s mental characteristics and behavioral patterns and explore corresponding training methods. In the process of analyzing these cases, teachers will guide students to think about ideological and political issues, such as how to respect children’s individuality and how to cultivate their fine qualities. In this way, students can improve their ideological and political literacy while learning professional theories ^[9]. Second, expand the educational channels of the second classroom. Teachers should organize students to carry out a variety of second-classroom activities, such as participating in preschool education-themed speech contests, volunteer service activities, and kindergarten observation and research, so that students can deepen their understanding and application of professional knowledge and ideological and political concepts in practice. For example, teachers can arrange students to participate in kindergarten volunteer programs, where they can tell stories to children, play games with them, assist in learning, and care for children. This allows them to understand the significance of preschool education more concretely, enhance their sense of social responsibility and responsibility, and put the political theories learned in class into practice, achieving the unity of knowledge and action ^[10].

4.3. Promote school-enterprise cooperation and expand practical education platforms

The cultivation of preschool education professionals should be centered on the development needs of the preschool education industry. This means that schools should establish cooperation mechanisms with industry enterprises, jointly cultivate talents with enterprises, and build practical education platforms. This not only

enables timely understanding of industry development trends and talent demand information but also integrates the educational resources of enterprises to enhance the effectiveness of talent cultivation ^[11]. First, establish school-enterprise cooperation mechanisms. Schools can strengthen communication with kindergartens and early education institutions through regular mutual visits and seminars to stay updated on industry dynamics and talent needs. For example, colleges and universities can form long-term strategic partnerships with well-known local preschool education institutions. They can regularly send teachers and students to these kindergartens for observation, learning, and activities, while also inviting kindergarten principals and outstanding teachers to give lectures and training at the university. This sharing of cutting-edge industry information and practical experience ensures that teaching content aligns with industry needs ^[12]. Second, build an integrated industry-university-research collaborative education platform. Colleges and universities can work with kindergartens to formulate talent training programs for preschool education majors. They can adjust curriculum settings and teaching content according to the actual job requirements of preschool education institutions, making courses more relevant to real-world preschool education practices. In addition, emphasis should be placed on the construction of practical training bases to provide students with more opportunities for hands-on operations, enabling them to improve their professional abilities and ideological and political literacy in a real workplace environment. Third, integrate curriculum-based ideological and political education with enterprise culture. Schools can incorporate the concept of curriculum-based ideological and political education into enterprise culture building and encourage professional teachers and excellent grassroots teachers to jointly develop lesson plans and practical activities with ideological and political education elements. Students can then understand the connotation of preschool education work and professional knowledge through case analysis, role-playing, and study visits ^[13]. For instance, inviting experts, professors, and preschool educators to develop educational cases on children's moral education. Through the actual teaching environment and case analysis of these cases, students can learn how to organically integrate ideological and political education into kindergarten teaching materials, fostering their good qualities. By participating in case teaching and practical assignments, students can acquire more professional knowledge and skills, further enhancing their ideological and political literacy and operational capabilities.

4.4. Improve teaching evaluation and implement diversified assessment

The evaluation of curriculum-based ideological and political education should follow the logic of “evaluation-reflection-improvement”, using scientific evaluation to promote in-depth reflection and guide the continuous advancement of teaching reforms. First, optimize evaluation content. Teachers should not only assess students' professional knowledge and skills but also focus on evaluating their ideological and political literacy. For example, in professional course exams, more ideological and politically related essay questions or case analysis questions can be added to test students' understanding and application of ideological and political knowledge. Second, enrich evaluation methods. Teachers should adopt diversified assessment methods, such as evaluating students' class attendance and homework completion, and using course papers, practical reports, etc. ^[14-15]. Third, expand the evaluation subjects. In addition to teacher evaluation, student self-assessment, peer assessment, and evaluations from social stakeholders such as parents and kindergartens should be introduced. For example, after students complete their internships, they can reflect on and summarize their learning process and achievements; kindergartens can evaluate students' performance during the internship, including work attitude, professional ability, and ideological and political literacy; parents can assess the morality and

behavior displayed by students in daily life; teachers can integrate these evaluation results into the students' comprehensive evaluation system to provide more comprehensive feedback for their growth and development.

5. Conclusion

In conclusion, the teaching reform of ideological and political education in the curriculum of the pre-school education major in colleges and universities is a long-term and arduous task, which is of great significance for cultivating high-quality pre-school education professionals. In the actual teaching process, teachers should pay attention to optimizing the content setting, innovating the teaching mode, promoting school-enterprise cooperation, and improving the teaching evaluation, so as to improve the teaching quality of ideological and political education in professional courses, realize the organic unity of knowledge transfer and value guidance, and cultivate students into pre-school education talents with firm ideals and beliefs and noble professional ethics.

Disclosure statement

The author declares no conflict of interest.

References

- [1] Zhong YL, 2024, Research on the Integration of Curriculum and Practice and Ideological and Political Education under the “1+X” Certificate System in the Higher Vocational Pre-school Education Major. *University*, 2024(S2): 46–48.
- [2] Zeng QL, 2024, Exploration on the Construction of Ideological and Political Education in the Course of “Pre-school Children’s Games” in Higher Vocational Colleges—Taking Chongqing City Vocational College as an Example. *Educational Observation*, 13(36): 52–54 + 103.
- [3] Yin YX, 2024, Research on the Practical Exploration of Integrating Excellent Traditional Chinese Culture into the Curriculum of Higher Vocational Pre-school Education Major under the Background of Curriculum Ideological and Political Education. *Teacher*, 2024(35): 6–8.
- [4] Zhang TT, Ma LY, Li G, 2024, The Impact of Ideological and Political Education of Red Gene Curriculum on the Professional Identity of Pre-school Education Majors. *Heilongjiang Science*, 15(23): 117–119.
- [5] Li HW, Xiao YX, 2024, Construction of the Evaluation Index System of Ideological and Political Education in the Curriculum of Pre-school Education Major in Colleges and Universities Based on the CIPP Model. *Educational Observation*, 13(33): 94–99. <https://doi.org/10.16070/j.cnki.cn45-1388/g4s.2024.33.007>
- [6] Wang MM, Fu SJ, 2024, Exploration and Practice of Integrating Ideological and Political Education into the Curriculum of Higher Vocational Pre-school Education Major—Taking “Children’s Games and Guidance” as an Example. *Teacher*, 2024(32): 9–11.
- [7] Li Z, 2024, The Art Activity Design of Higher Vocational Pre-school Education Majors from the Perspective of Curriculum Ideological and Political Education—Taking the Course of Pre-school Children’s Art Activity Design as an Example. *Shanghai Fashion*, 2024(11): 89–91.
- [8] He Y, Gong LP, Liang YX, 2024, The Reform and Practice of the Children’s Literature Course in the Pre-school Education Major from the Perspective of Curriculum Ideological and Political Education—Taking Guangxi

- College for Preschool Education as an Example. *Guangxi Education*, 2024(30): 61–64 + 118.
- [9] Zhang CP, Liu HC, 2024, Exploration on the Integration of Dance Curriculum and Ideological and Political Curriculum in Pre-school Education Major—Comment on “Exploration and Practice of Teaching and Talent Training Mode in Pre-school Education Major in Colleges and Universities”. *Journal of the Chinese Society of Education*, 2024(10): 121.
 - [10] Xiao X, Zheng JJ, 2024, The “Five New” Construction and Practice of Ideological and Political Education in Language Courses of Pre-school Education Major—Based on the Background of Normal Education Certification. *Higher Education Forum*, 2024(9): 52–57.
 - [11] Huang L, 2024, Exploration and Practice of the Teaching Mode of Ideological and Political Education in Aesthetic Education Courses of Higher Vocational Pre-school Education Major Group—Taking the MOOC Online High-quality Course “Children’s Dance Choreography and Teaching” as an Example. *Journal of Ningbo Institute of Education*, 26(4): 92–96. <https://doi.org/10.13970/j.cnki.nbjyxyxb.2024.04.019>
 - [12] Tang BY, 2024, Exploration on Curriculum Ideological and Political Education in Pre-school Education Major in Higher Normal Colleges—Taking the Course of Kindergarten Class Management as an Example. *Guangxi Education*, 2024(24): 57–61.
 - [13] Fu N, Xu XY, 2024, Exploration on the Integration of Curriculum Ideological and Political Education into the Teaching Reform of Pre-school Education Major Courses—Taking the Course of Pre-school Children’s Health Care as an Example. *Educational Observation*, 13(24): 101–105. <https://doi.org/10.16070/j.cnki.cn45-1388/g4s.2024.24.033>
 - [14] Xu YL, 2024, Thoughts on Integrating the Excellent Cultural Resources of Various Ethnic Groups in Yunnan into the Construction of Curriculum Ideological and Political Education in Pre-school Education Major in Higher Vocational Colleges. *Dahe Art News*, July 5, 2024, 18.
 - [15] Chen YP, 2024, The Implementation Path of “Curriculum Ideological and Political Education” Collaborative Education in Curriculum Groups of Higher Vocational Colleges—Taking the Chinese Curriculum Group of Pre-school Education Major as an Example. *Journal of Hubei Open Vocational College*, 37(12): 103–106.

Publisher’s note

Bio-Byword Scientific Publishing remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Practical Paths for Higher Vocational Education to Empower Rural Revitalization in the Kangba Region

Huai Deng*

Ganzi Vocational College, Ganzi Tibetan Autonomous Prefecture 626100, Sichuan, China

**Author to whom correspondence should be addressed.*

Copyright: © 2025 Author(s). This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0), permitting distribution and reproduction in any medium, provided the original work is cited.

Abstract: Under the background of rural revitalization, higher vocational education plays a crucial role in talent cultivation, industrial layout, and ecological civilization construction. As an important multi-ethnic integration area in western China, the Kangba region undertakes key tasks such as plateau ecological protection, ethnic cultural inheritance, and new energy industrial layout. Promoting rural revitalization in the Kangba region through higher vocational education, deepening industry-education collaboration, innovating educational carriers, and driving higher vocational education to empower rural revitalization and modern development in the Kangba region.

Keywords: Higher vocational education; Kangba region; Rural revitalization

Online publication: September 18, 2025

1. Introduction

In January 2025, the Central Committee of the Communist Party of China and the State Council issued the National Rural Revitalization Plan (2024–2027), proposing to implement the rural revitalization strategy and steadily advance the “five revitalizations” of rural industries, talents, culture, ecology, and organizations ^[1]. Rural revitalization is a strategic concept with systematic and complex top-level planning. The effective implementation of top-level design requires the joint promotion of “1+X” factors, and the most fundamental and core factor for implementing the rural revitalization strategy is rural human capital. Higher vocational education can lay the foundation for the accumulation and transformation of rural human capital. To promote rural revitalization, education authorities at all levels and local governments have introduced relevant policies, improved the agriculture-related higher education system, optimized and upgraded vocational education, and provided talent reserves for rural revitalization. The Kangba region, as an important area in southwest China, is renowned for its unique geographical environment and rich ethnic culture. However, due to various factors, the

development level of vocational education in the Kangba region is relatively low, modern industries are backward, and the development of plateau characteristic agriculture and animal husbandry is restricted. Therefore, optimizing and upgrading the higher vocational education system in the Kangba region, strengthening the cultivation of rural digital talents and e-commerce talents, and developing AI + plateau characteristic agriculture and animal husbandry will inject a “cardiotonic” into rural revitalization in the Kangba region.

2. Necessity of higher vocational education promoting rural revitalization in the Kangba region

2.1. Higher vocational education is a cradle for cultivating skilled talents

Since the 18th National Congress of the Communist Party of China, the president of the CPC has made unremitting efforts to coordinate education, science and technology, and talent work. He pointed out that “we should adhere to the priority development of education, self-reliance and self-improvement in science and technology, and talent-led drive”. Education, as the core element of human capital, is also an important way to promote the continuous accumulation of human capital ^[2]. For the Kangba region, higher vocational education can, on the one hand, cultivate technical and skilled talents serving rural development; on the other hand, drive the technological research and development and product upgrading of small, medium, and micro enterprises through industry-education integration, and provide skill education and lifelong learning services for local people. The important social contribution and effect of higher vocational education lie in large-scale talent output. National higher vocational colleges output over 10 million technical and skilled talents to the society every year, covering key fields such as high-end manufacturing, information technology industry, medical and health care, artificial intelligence, and cultural and tourism industries. Data shows that about 70% of vocational college graduates enter small, medium, and micro enterprises, alleviating the shortage of technical talents ^[3]. For underdeveloped areas such as the Kangba region, talents from higher vocational education can establish cross-field collaboration to promote industrial chain integration through technical output and industrial support, help local enterprises enhance competitiveness, promote industrial upgrading, and drive the balanced development of the regional economy.

2.2. Higher vocational education is a pioneer in transforming productivity

Developing new productive forces is an inherent requirement and important focus for promoting high-quality development. There is a close relationship between higher vocational education and the development of socially productive forces in rural areas. For higher vocational education, a two-dimensional deconstruction from the main elements of productivity composition and the operation process of productivity runs through the cultivation of technical and skilled talents, knowledge innovation, and cultural inheritance. At the same time, as the main driving force for technology diffusion and application, it applies new technologies to rural development, thereby realizing the multi-dimensional coupling of advanced technology with people, rural communities, and ecological chains ^[4]. Nowadays, the characteristics of China’s vocational education type have become increasingly prominent. On the one hand, higher vocational education improves new productive forces by cultivating high-skilled talents for reproduction, and promotes the overall upgrading of local workers with the demand for knowledge and skill improvement. On the other hand, the coupling and embedding of new productive forces and higher vocational education have caused profound changes in various elements in the field of higher vocational education, promoting the leapfrog development and upgrading of higher vocational

education productivity. The development of new productive forces has accelerated the intelligent and digital process of higher vocational education, improved the ability of vocational education to adapt to the development of the new era, promoted higher vocational education to be more in line with the requirements of the times and regional development models, and driven the quality and upgrading of regional industries ^[5].

2.3. Higher vocational education is a frontier for cultivating ecological civilization

The president of the CPC pointed out: “Striding into the new journey, we must support high-quality development with high-quality ecological environment, break through the resource and environmental constraints on sustainable development, activate the green ‘engine’ of high-quality development, and improve the ‘gold content’ with ‘green content’” ^[6]. The Kangba region is known as “a bright ecological pearl on the plateau”. Therefore, people must adhere to the orientation of ecological priority and green development, and run green and low-carbon development through the whole process of economic construction. The development path of vocational education is closely related to the development direction of modern industrial civilization. Higher vocational education plays a vital role in promoting the development of modern industry and building an ecological power ^[7]. To implement the fundamental task of “fostering virtue through education”, higher vocational education must first start from ecological moral education, closely combine ecological civilization construction with technical services, organically integrate ecological cultural awareness into curriculum, ideological and political education, and cultivate high-quality technical and skilled talents with ecological civilization literacy ^[8].

3. Typical models in developed countries

3.1. American model

The United States has solved the development problems in rural areas in roughly three stages ^[9]. In the early stage, the focus was on transforming rural infrastructure, including the upgrading of water, electricity, and roads, to improve the basic conditions for agricultural and rural development; in the middle stage, attention was paid to the urban-rural gap. On the one hand, agricultural subsidies were strengthened; on the other hand, various means such as introducing emerging industries and providing technical assistance were used to increase residents’ income and alleviate the urban-rural income gap; in the later stage, emphasis was placed on education and training, employment, ecological environment protection and other fields, focusing on cultivating the sustainable development capacity of rural areas and promoting the continuous development of backward and underdeveloped areas. In terms of vocational education, the “Agricultural Vocational Training” project in the United States ^[10] has clarified specific measures for developing sustainable agriculture and designed characteristic training programs suitable for poor areas to improve farmers’ awareness and participation in sustainable agriculture, including five core capabilities: industrial practice, operation and sales, financial planning and resource acquisition, business planning and management, and land acquisition and transfer.

3.2. German model

Germany attaches great importance to industry-education integration ^[11]. First, promote in accordance with the law to ensure the authority of the industry-education integration mechanism; second, be clear and specific to ensure the operability of the industry-education integration mechanism; third, design systematically to ensure the effectiveness of the industry-education integration mechanism. In 2014, Germany established the Vocational

Education and Continuing Education Alliance, which runs the concept of industry-education integration through the whole process of vocational education work, integrates human resource development into the demands of the times and regional development, and seeks higher-level vocational education goals ^[12]. On the one hand, effectively implement the synchronous planning and development of vocational education and the economic society. On the other hand, further promote the close integration of vocational education and industrial development, and promote vocational education to integrate into the whole process of economic and social development.

3.3. Japanese model

Japan attaches importance to carrying out rural science and technology education to improve the agricultural management ability of the general public ^[13]. For areas with harsh natural conditions, first, increase investment in public facilities construction to improve the basic conditions of poor areas; second, increase vocational training to improve the production technology level and independent management ability of agricultural workers, and ultimately improve the output and quality of agricultural products; third, introduce incentive policies to encourage farmers to operate independently, cultivate new agricultural subjects, and increase farmers' income; fourth, protect culture according to local conditions and inherit skills in combination with characteristics. Japan relies on vocational education to manage rural areas according to local conditions in combination with local characteristics, including the rational protection and development of local cultural resources. In addition, Japan encourages industry associations, private enterprises, etc., to give full play to their advantages to promote the protection of characteristic culture and traditional skills.

4. Practical paths for rural revitalization in the Kangba region

4.1. Improving infrastructure construction and industrial layout

In recent years, the state has attached great importance to the infrastructure construction in the Kangba region, including the construction of Sichuan-Tibet Railway and Sichuan-Qinghai Railway, the planning and construction of multiple expressways, the renovation and upgrading of national highways, provincial highways, and rural roads in the region, ensuring that every household has access to electricity and the Internet, and express delivery services reach home. Since 2022, PetroChina has comprehensively laid out the “One Network and Two Corridors” based on the geographical and traffic conditions of the Western Sichuan Plateau, namely the “photovoltaic network”, “gas corridor”, and “electricity corridor”, which has not only promoted the new energy transformation and upgrading in the plateau area but also effectively protected the ecological environment. In 2022, the world's largest hydro-solar complementary power station — Yalong River Kola Photovoltaic Power Station was completed, becoming a new model for large-scale centralized development of clean and renewable energy in the world; the largest single high-altitude photovoltaic project under construction, and multiple large-scale water conservancy and hydropower projects are under construction. In addition, using the rich tourism resources in the Kangba region, people will fully implement the strategic deployment of “adhering to cultural integration with tourism and tourism highlighting culture, and promoting the in-depth integration and development of culture and tourism”, and strive to promote the high-quality development of culture and tourism industries, making new contributions to the comprehensive economic and social development of the region ^[14].

4.2. Empowering talent cultivation in the Kangba region through higher vocational education

First, digital empowerment ^[15]. Use the virtual simulation training platform of higher vocational colleges to solve the problem of insufficient enterprise equipment. For example, construction majors simulate construction scenarios through BIM technology. Second, cross-regional collaboration: establish vocational education groups and integrate regional industrial chain resources. For example, jointly build vocational education alliances, unite secondary and higher vocational colleges, and co-build talent databases through school-enterprise cooperation. Third, use higher vocational education resources to establish a lifelong learning system in the Kangba region: carry out “recycling” training for enterprise employees to form a closed loop of “enrollment—training—employment—re-education”; carry out knowledge and skill training for farmers and workers to improve their employment ability.

4.3. Leading ecological civilization construction and industrial development in the Kangba region through higher vocational education

First, establish a holistic view and an educational view of ecological civilization. In the education process, organically integrate the essence of ecological thought in traditional Chinese culture, the development of Western ecological ethics, and Marxist discourse on the relationship between humans and nature, cultivate green production and lifestyle, and build a green ecological campus. Second, focus on improving students’ green action ability. Take ecological civilization education as the starting point to promote their own green, intelligent, and modern development. Third, highlight the cultivation of green technical skills. Guide students to pay attention to the green development of the ecological environment, economy, and society, establish green development goals, and attach importance to professional green technical skills required by various industries and occupations in the Kangba region, including skills required for providing environment-friendly products or services, as well as environment-friendly skills related to green technologies, processes, procedures, production tools, and materials. Fourth, pay attention to setting up green majors according to the demand for skilled talents in typical green economic fields, and carry out green transformation of existing majors ^[16]. For example, set up cultural and tourism majors to connect with the characteristic cultural and tourism industries in the Kangba region; set up environmental protection-related majors dedicated to plateau ecological protection; set up agriculture and animal husbandry-related majors to build a modern digital plateau agriculture and animal husbandry industry; set up Tibetan medicine and characteristic health care-related majors to lead the medical and health care industries in the Kangba region.

Funding

This paper is part of the research results of the 2024 project of Kangba Culture Research Center, a key social science research base in Sichuan Province, with the project name “Research on Higher Vocational Education Promoting Rural Revitalization in the Kangba Region” and the project number: KBYJ2024B0011.

Disclosure statement

The author declares no conflict of interest.

References

- [1] The Central Committee of the Communist Party of China and the State Council Issued the National Rural Revitalization Plan (2024–2027). People's Daily, January 23, 2025, 1.
- [2] Du YH, Yang XM, 2018, Rural Revitalization: Rural Education as a Strategic Support and Its Development Path. *Journal of South China Normal University (Social Science Edition)*, 2018(2): 76–81 + 192.
- [3] The State Council, 2014, Decision of the State Council on Accelerating the Development of Modern Vocational Education. *Vocational and Technical Education*, 35(18): 45–49.
- [4] Qi ZY, Wu ST, 2025, Logical Path and Collaborative Path of Higher Vocational Education Empowering New Productive Forces. *Journal of College Education Management*, 19(1): 49–61.
- [5] Xie LC, 2024, Vocational Education Assisting in the Cultivation of Green Skilled Talents under the Background of New Productive Forces. *Contemporary Vocational Education*, 2024(3): 23–29.
- [6] Zhou SX, 2013, Moving towards a New Era of Ecological Civilization — Learning President of the CPC's Important Expositions on Ecological Civilization Construction. *Qiushi*, 2013(17): 17–19.
- [7] Shao Changlan. Reflection on the Value Orientation of Higher Vocational Education Training Objectives from the Perspective of Ecological Civilization. *Chinese Vocational and Technical Education*, 2014(9): 32–35.
- [8] Zhang J, Lv YJ, Shen XY, 2024, Towards Chinese-Style Modernization: Value, Representation and Path of Ecological Civilization Education Integrating into Higher Vocational Education. *Education and Vocation*, 2024(2): 52–58.
- [9] Pan QL, Han Z, Chen JY, 2021, Staged Development of American Rural Areas and Its Enlightenment to China's Rural Revitalization. *World Agriculture*, 2021(9): 76–82.
- [10] Wang LB, Xiao SH, Han XL, 2016, Characteristics and Enlightenment of American Farmers' Vocational Training System. *China Adult Education*, 2016(4): 118–121.
- [11] Liu LX, 2015, Experience of Industry-Education Integration in German Vocational Education and Its Enlightenment to China. *Chinese Vocational and Technical Education*, 2015(30): 18–23 + 37.
- [12] Zhu TF, 2004, Employment Orientation of German Vocational Education and Its Reference. *Research in Educational Development*, 2004(2): 45–47.
- [13] Qu XL, Liu Y, 2021, Experience and Enlightenment of Vocational Education Serving Rural Construction in Developed Countries. *Rural Science and Technology*, 12(30): 20–22.
- [14] Li J, 2024, Research on Digital Economy Empowering High-Quality Development of Cultural and Tourism Industries - A Case Study of Ganzi, Sichuan. *Journal of Chengdu Technological University*, 27(5): 70–76.
- [15] Xu YH, Zhou Y, Chen YH, 2022, Research on the Path of Digital Empowerment for High-Quality Talent Cultivation in Higher Vocational Education. *Journal of Xinjiang Vocational University*, 30(2): 23–27.
- [16] Yang XJ, Yu CY, Zhang RJ, et al., 2018, Research on the Development of Green Industries in Ethnic Areas: A Case Study of Ganzi County, Ganzi Tibetan Autonomous Prefecture, Sichuan Province. *West Forum on Economy and Management*, 29(3): 11–17.

Publisher's note

Bio-Byword Scientific Publishing remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

How to Prepare a Music Lesson by Analyzing Teaching Materials: Understanding the Non-musical and Musical Languages in Music Teaching Materials

Ya Liu*

Xijing Company Subsidiary School, Xi'an 710065, Shaanxi, China

**Author to whom correspondence should be addressed.*

Copyright: © 2025 Author(s). This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0), permitting distribution and reproduction in any medium, provided the original work is cited.

Abstract: Lesson preparation is a crucial part of the teaching process, which is directly related to the quality and efficiency of classroom teaching. However, in the actual lesson preparation for music teaching, there are some problems. For example, when teachers see the teaching materials of a music lesson, they don't know from which aspects to prepare the lesson, what the contents of lesson preparation are, what the order of lesson preparation is, from which aspects they should think about lesson preparation, and where the key and difficult points of lesson preparation are for different types of music courses. Starting from the perspectives of the explicit and implicit non-musical and musical languages contained in music teaching materials, this paper specifically analyzes what the implicit and explicit musical and non-musical languages in the teaching materials include, from which angles teachers should analyze and think about different types of courses, and how teachers can prepare a music lesson well in specific teaching. It is hoped to provide some references for music teachers' ideas and methods of lesson preparation.

Keywords: Music in primary and secondary schools; Teaching materials; Lesson preparation; Musical language; Non-musical language

Online publication: September 18, 2025

1. The non-musical and musical languages in the music score in teaching materials

By organizing relatively complete and typical music scores, it can be found that the arrangement and composition of teaching material examples mainly consist of four parts: pictures, graphic scores (occasionally), texts, and music scores. Through observing music teaching materials (taking the staff notation as an example), summarizing and organizing the composition of teaching material contents, and starting from the characteristics of the music discipline, the teaching material contents are divided into non-musical language and musical language. The non-musical language refers to the contents expressed in ways other than musical language, mainly including picture information and text information. The picture information mainly includes pictures and

graphic scores. The text information mainly includes the titles of musical works, the composers and lyricists, the lyrics, the description of musical emotions, the after-class thinking, the knowledge links, and other information that describes music in words. The musical language refers to the contents expressed in musical language, mainly including the musical scores of music—that is, the core elements that constitute music, such as melody, rhythm, meter, musical notations, musical forms, harmony, etc.

2. Characteristics of non-musical and musical languages

By sorting out the teaching materials of music courses in primary and secondary schools, educators can find that the printed musical examples in teaching materials for singing lessons are generally relatively complete. Since the musical examples in teaching materials for appreciation lessons are relatively long in length, usually only relatively important musical passages and themes are excerpted in the teaching materials. Therefore, for the teaching materials of appreciation lessons, the musical language that can be seen from the information on the excerpted musical scores is very limited. So educators need to dig deeply into the relatively complete musical scores of musical works and conduct an overall analysis. For the brief musical passages and themes that educators can see in the music teaching materials, and the relatively complex music that educators cannot see in the teaching materials but can hear, the musical language also has a second characteristic, that is, the explicit and implicit characteristics of the musical language.

The non-musical and musical languages on the music score in teaching materials have explicit and implicit characteristics (**Figure 1**). Educators can see the text information and picture information on the music score in teaching materials, but there is also a part of non-musical language information that educators cannot see, that is, the hidden non-musical language. The hidden non-musical language is generally hidden in the songs and needs to be transformed through listening and experiencing. During this process, the musical language is transformed into written language for expression. For example, the musical emotions, musical pictures, and musical feelings hidden in the music score, etc. In teaching, especially in appreciation lessons, the teacher's excavation of the hidden non-musical language and guidance for students play a crucial role in stimulating students' interest in listening, guiding students to understand the musical content, comprehend the musical structure, and grasp the musical style. The explicit musical language refers to the content of the music score that educators can directly see in the music score, such as mode, meter, notes, rhythm, melody, measures, musical notations, etc. The implicit musical language refers to the vertical content that is sometimes invisible on the music score and hidden in the music score, such as the harmony, orchestration, dynamics, polyphony, etc., of the music. The teaching process of teachers is a process of digging deeply into the implicit musical language of the music score, teaching through non-musical language, and finally returning to both the explicit and implicit musical languages.

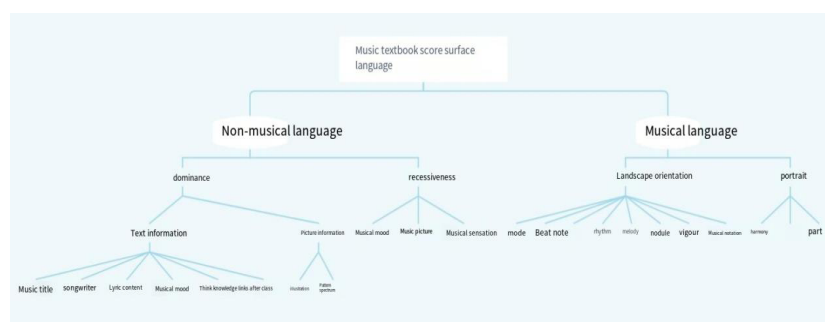


Figure 1. Music textbook notation language

3. The relationship between non-musical and musical languages

The non-musical and musical languages on the music score are independent of each other. The purposes they aim to achieve are different. The purpose of non-musical language is to attract students' attention, make the abstract musical content concrete, reduce the difficulty of students' learning, and cultivate students' musical perception ability. For example, in "The Skater's Waltz" in the first volume of Grade 7, the graphic scores of each musical theme are printed in the second volume of the teaching materials, which is convenient for students to observe the direction of the musical melody and experience the changes of the musical melody.

Musical language is the essence of the music discipline and the fundamental purpose to be achieved in music discipline teaching. The teaching purpose of the music discipline is to guide students to be able to read, understand, and sing musical language.

The non-musical and musical languages on the music score are interconnected and complementary to each other. In actual teaching materials, educators will find that a music teaching material contains both texts, pictures, and music scores. The non-musical language of music teaching materials is expressed based on musical language and is a specific manifestation of musical language. For example, the illustrated characters, illustrated scenes, color matching, and graphic scores in the teaching materials are all designed based on the musical content, musical events, and musical elements of the music score. Musical language is made intuitive, concrete, and visualized through non-musical language. The non-musical and musical languages in music teaching materials work together. Musical language reflects the characteristics of the music discipline, and non-musical language enriches and supplements musical language, jointly serving music classroom teaching.

4. How to understand the non-musical and musical language information in music teaching materials

Pay attention to the non-musical language in music teaching materials. In lesson preparation, educators should pay attention to the relevant illustrations and graphic scores used in the music score. Generally, the illustrations in the teaching materials are closely related to the content of the song, and the illustrations also hide the requirements for teaching objectives. For example, in the lesson "Moon Sister, Come Down" in the first volume of Grade 6 of the People's Music Edition (staff notation), there is an illustration of "Classification of Western Musical Instruments" (Musical Example 4) in the book, which implies that in this lesson, educators need to introduce Western bowed string instruments and woodwind instruments, and understand the shape, structure, timbre, and playing methods of the instruments.

Pay attention to the information about the title of the musical work, the composer, and the lyricist in lesson preparation. Especially for more famous works or authors, educators need to have a more detailed and in-depth understanding. The understanding of the song content is mainly reflected through the lyrics. In lesson preparation, educators should pay attention to the main characters, actions, parts of speech, and events expressed in the lyrics. These can also be used as the basis for creating scenarios in the introduction part of the musical work. The after-class thinking is the guide for the teaching objectives and teaching direction. In lesson preparation, educators should pay attention to the abilities and qualities that students need to master as required by the after-class thinking questions. Knowledge expansion is mainly concentrated in the teaching materials for Grades 7–9. In lesson preparation, teachers should grasp the key words, catch the direction of knowledge expansion, and conduct in-depth expansion in a certain knowledge area and direction.

Selectively focus on the explicit or implicit characteristics of musical language according to different types

of courses. From the perspective of teaching material arrangement, in singing lessons, the music scores are generally printed in more detail and completely, and the musical language can be clearly seen in the teaching materials. Therefore, in singing lessons, lesson preparation should focus more on grasping the music scores in the teaching materials, such as the meter, rhythm, melody, musical notations, and song structure of the song. From the perspective of the teaching objectives of singing lessons, the main teaching objective of singing lessons is generally for students to learn to sing songs. Paying attention to the musical elements in the music score is conducive to students mastering the ability to read music scores and accurately sing the song, thus completing the teaching task. For appreciation lessons, while paying attention to explicit music, educators should dig deeper into implicit musical language. Generally, the music scores of appreciation works are long, the musical structure is relatively complex, there are no lyrics, and the music is more abstract. In teaching, there may be phenomena where students cannot understand, and teachers do not know how to teach. In response to this phenomenon, teachers should base on the complete musical example and work hard on analyzing the implicit musical language in the music score, and do more work on music score analysis. For example, first, listen to the work completely in the music score. Since the music may be more abstract, educators need to combine the non-musical language of the music, including the title of the song, the composer and lyricist, the illustrations of the music, after-class thinking, knowledge links, etc., and consult relevant materials to comprehensively grasp the scenes and content expressed by the music, laying a foundation for the analysis of musical language. In the analysis of musical language, in addition to the explicit musical language mentioned above, there is also implicit musical language, such as musical form structure, paragraphs, musical themes, etc. In addition to the horizontal musical line analysis, there is also vertical polyphonic music analysis, such as musical orchestration and harmony. Regarding orchestration, which instrument is the main instrument for this theme? Why use this (type of) instrument? What is its function? Regarding harmony, what color does this harmony combination have in the music? What musical feeling does it give you?

Do a good job in the transformation from musical language to non-musical language. In teaching, teachers should listen to and analyze musical works relatively objectively. They should not only combine the thinking of their own professional discipline but also understand the learning situation of students, and transform musical thinking and musical language into something that students can understand and comprehend, making the abstract musical language concrete. The ways to make abstract language concrete can be achieved through several paths: 1. Visualize musical language. In appreciation lessons, the musical works are long, and many musical themes and paragraphs are relatively complex. Therefore, in teaching, educators can use music scores, pictures, videos, graphic scores, colors, shapes, etc., to more intuitively and concretely display musical language, reducing the difficulty for students to understand and remember. 2. Act out musical language. Try to mobilize all the sensory organs of students to make a joint response, promote the coordination of various parts of the body, form a variety of sensory linkages, effectively promote students' ability to transform listening into musical expression, and exercise students' attention, memory, control ability, image thinking, logical thinking, and body coordination ability. 3. Transcribe musical language into words. That is, use language to express the musical scenes depicted and expressed by music. This process is also a process in which students transform their musical feelings and understanding of music into specific expressible words through sensory perception, exercising students' musical perception and aesthetic ability, the ability to transform musical language into written language, the ability to express in written language, and the ability to analyze and understand music.

The purpose of non-musical language is to better understand musical language. The fundamental purpose

of music teaching is to cultivate students' ability to transform musical language into non-musical language, that is, students' understanding of musical language. Non-musical language is only a method and means for teaching and plays an auxiliary role in understanding music. In real life, it is very rare for students to actually see music scores like those in teaching materials. More often, it is music without scores, or even music without knowing the title or the author. It may be the music that students hear when they enter a concert hall, on their mobile phones, or on the roadside. This kind of appreciation and listening happens at any time. Therefore, the most important thing in music classroom teaching is to let students maintain sensitivity and familiarity with all kinds of music and be able to have a certain awareness of music at the moment of listening, such as the emotion, content, type (pop or classical), period, and style of the song. Music teaching cultivates students' ability to experience-perceive-analyze-understand, and this ability is also an important ability to be achieved in the teaching objectives of the compulsory education stage.

Embodied cognition: Transform musical language into body language ^[1]. Music is a practical discipline, and practical activities are a process in which the human brain and body actively participate. Therefore, music activities should not be separated from the participation of the human brain and body. The theory of embodied cognition believes that human cognition is actually the product of the interaction among the brain-body-environment, advocating that the body plays a key role in learning ^[2]. Students' musical experience is actually a process in which students comprehensively mobilize all parts of their bodies, that is, seeing with the eyes, listening with the ears, singing with the mouth, moving the body, having a sense of touch, and performing in a comprehensive scenario. In teaching, educators should first mobilize students' physical perception of music. For example, in the initial listening, let them freely make appropriate movements along with the music. Most of the time, as long as students hear the music, their bodies will unconsciously move in rhythm with the music beat, which is the body's reflex. In actual classrooms, many teachers suppress students by asking them to sit straight or lie down to listen to music, ignoring students' physical perception of music. Corresponding activities should be designed according to the learning situation of different grades and types of courses to actively mobilize students' participation and experience.

The music discipline is distinct from other disciplines and possesses its own unique characteristics, namely abstractness, emotionality, temporality, and creativity. In music classroom teaching, it is essential to base teaching on the characteristics of the music discipline. Starting from the foundation of conducting an excellent class, which is to prepare a class well, teachers should deeply explore the non-musical and musical language information in music teaching materials. Depending on different types of music courses, they should focus on the explicit and implicit musical language information of music with appropriate emphasis. Additionally, they should do a good job in transforming between musical and non-musical languages. By making use of non-musical language, teachers can guide students to have a better understanding of musical language.

5. Conclusion

The characteristics of the music discipline follow the law of transitioning from sensory perception to rational understanding. In teaching, students' entire perception system should be mobilized, and teachers should also fully mobilize their own sensory system in lesson preparation. They should have interdisciplinary thinking and learn to view the lesson preparation and teaching work from multiple perspectives, including "art", "sports", and other disciplines. This will open up the teaching ideas, diversify teaching activities, and broaden teaching

horizons. When it comes to interdisciplinary or multidisciplinary integration and reference, educators must also adhere to the principle of moderation. It is necessary to reflect the music thinking, language, knowledge, and ability of the music discipline. In lesson preparation, educators should start from the textbook and grasp the music language and non-music language of the spectrum. From these two perspectives, lesson preparation will be more diverse, the grasp of teaching content will be more comprehensive, and the design of teaching ideas and activities will be more diverse.

Disclosure statement

The author declares no conflict of interest.

References

- [1] Cui XR, 2021, The Multi-sensory Linkage Music Teaching Method: A Revolution in Music Classroom Teaching. *Music Life*, 2021(2): 15–20.
- [2] Mao YJ, 2022, The View of Music Teaching from the Perspective of Embodied Cognition. *China Music Education*, 2022(11): 36–42.
- [3] Lai JQ, 2025, Innovation and Practice of Sound Integration Teaching Model Based on Consistency of “Preparation Teaching Learning Evaluation”. *New Curriculum Review*, 2025(5): 107–114.
- [4] Tong Y, 2024, Immersive Lesson Preparation Method for Primary School Music Teaching. *Qintong*, 2024(21): 30–32.
- [5] Lian YZ, 2024, Integrated Practice of “Preparation Teaching Learning Evaluation” in Junior High School Music. *Asia Pacific Education*, 2024(21): 119–122.
- [6] Liu LL, 2024, Exploration of Integrating Digital Technology into Primary School Music Classroom Teaching. *Contemporary Music*, 2024(9): 50–52.
- [7] Xiao J, 2023, Research on the Influence of Score Analysis on Erhu Performance. *Comedy World (Second Half)*, 2023(8): 71–73.
- [8] Lu YL, 2022, Exploration of “Reading Score” in Piano Teaching. *Drama House*, 2022(18): 187–189.
- [9] Li N, 2022, Analysis of Teaching Strategies for Junior High School Music Score Recognition. *Collection of Basic Education Papers for Industry Enterprises Guanjia Hui Ethnic Township Junior High School in Yongqing County, Hebei Province*, 273–277.
- [10] Leng Y, 2020, The Cultivation of Musical Sense in Piano Teaching. *Guangdong Teacher Continuing Education Association Proceedings of the Second Teaching Seminar of Guangdong Teacher Continuing Education Association (Part 1)*, 58–63.
- [11] Gao YJ, 2024, Preparation Design and Implementation Ideas for Large Unit Teaching in Music Discipline. *New Campus*, 2024(11): 80–82.
- [12] Yang XL, 2023, New Exploration of “Teaching According to Students’ Abilities” — Design of Music Teacher’s Preparation Template. *Shanxi Education (Teaching)*, 2023(8): 37–38.

Publisher’s note

Bio-Byword Scientific Publishing remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Research on the Development and Application of Digital Resources in College Physical Education under the Background of Blended Teaching: Taking the Empirical Study of Swimming Teaching as an Example

Yang Xu*

Beijing International Studies University, Beijing 100024, China

**Author to whom correspondence should be addressed.*

Copyright: © 2025 Author(s). This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0), permitting distribution and reproduction in any medium, provided the original work is cited.

Abstract: The traditional teaching mode is mainly characterized by “teachers teaching and students listening”, which exerts an adverse impact on the development of college physical education. Against this backdrop, this paper conducts an in-depth analysis of the significance and strategies for the development and application of digital resources in college physical education under the background of blended teaching, as well as the application effect of digital resources in swimming teaching. The purpose is to comprehensively improve the teaching quality of teachers and provide certain references for the digitalization of teaching in other sports programs.

Keywords: Blended teaching; College physical education; Swimming teaching

Online publication: September 18, 2025

1. Introduction

Opinions on Comprehensively Strengthening and Improving School Physical Education in the New Era clearly state that school physical education is a fundamental project for realizing the fundamental task of fostering virtue through education and enhancing students' comprehensive quality. It is also an important work for accelerating the modernization of education and building a powerful country in education and sports. School physical education plays a unique role in promoting the core socialist values, cultivating students' patriotism, collectivism, socialist spirit, and the will quality of being positive and tenacious in struggle, as well as realizing the goals of “nurturing intelligence through physical education” and “nurturing the mind through physical education.” Schools must strictly implement the rigid requirements for offering physical education courses, continuously expand the scope of courses, gradually increase class hours, and enrich course content. Schools

in the compulsory education stage and senior high school stage shall strictly offer physical education courses in full compliance with the national curriculum plan and curriculum standards. Basic education schools are encouraged to offer one physical education class every day. Colleges and universities shall incorporate physical education into their talent training programs, and students can only graduate if they meet the physical health standards and complete the required physical education credits. Universities and research institutes are encouraged to include physical education courses in the public curriculum system of postgraduate education ^[1]. Colleges and universities should follow the path in line with national development in accordance with national policy documents, so as to better cultivate talents.

2. The significance of research on the development and application of digital resources in college physical education against the background of blended teaching

From the teaching perspective, it greatly enriches teaching methods and content. Traditional physical education is limited by time and space, while digital resources, with the help of technologies such as multimedia and virtual reality, can present complex and abstract physical education knowledge (e.g., principles of sports biomechanics, tactical strategies) in an intuitive and vivid way, making it easier for students to understand and master ^[2]. At the same time, it breaks the constraints of teaching venues and time: students can conduct independent learning and review anytime and anywhere, and teachers can accurately adjust teaching strategies based on students' learning data to achieve personalized teaching and improve teaching quality and efficiency. For students, digital resources stimulate their interest and initiative in learning. Diverse forms such as videos, animations, and interactive games make physical education learning no longer dull but full of fun and challenges. Students can select appropriate resources according to their own needs and proficiency levels, arrange their learning progress independently, and cultivate their self-directed learning ability. In addition, online communication platforms allow students to interact with teachers and classmates at any time, share learning experiences and insights, create a positive learning atmosphere, and promote common progress. From the perspective of physical education development, the development and application of digital resources promote the modernization transformation of college physical education ^[3]. It facilitates the integration of physical education with other disciplines, such as computer science and data analysis, bringing new concepts and methods to physical education. Meanwhile, it also contributes to the sharing and exchange of college physical education resources, improves the overall educational level, and lays a solid foundation for cultivating high-quality sports talents with an innovative spirit and practical ability. It plays an undeniable role in promoting the long-term development of China's physical education cause ^[4].

3. Research on strategies for the development and application of digital resources in college physical education under the background of blended teaching

3.1. Conduct accurate demand research to clarify the direction of digital resource development

Colleges and universities need to investigate the digital resources for swimming teaching through questionnaires, interviews, and other methods to better understand the needs of students and teachers. Specifically, for teachers, the investigation should focus on the difficulties they encounter in traditional swimming teaching, such as the limitations of movement demonstration and the challenges in guiding students with individual differences.

For students, it should aim to understand their mastery of swimming knowledge, learning preferences, and the degree of learning support they expect to obtain through digital resources ^[5]. By adopting this approach, colleges and universities can not only better create relevant content, such as videos and animations for students, but also establish online communication platforms to facilitate better interaction between teachers and students, thereby better meeting the actual needs of both parties. For example, universities can help students gain a better understanding of the content to be covered in a swimming class by providing pre-class videos such as: Micro-courses on swimming principles (e.g., animations explaining the relationship between buoyancy and resistance); Demonstration videos of core movements (e.g., slow-motion analysis of freestyle breathing techniques); Question banks for preview quizzes (10 basic questions to assess pre-class learning outcomes). During the class, universities can develop a library of screen-projection materials for teachers, which includes error movement comparison charts and tools for generating group practice task sheets. This enables teachers to better track students' learning progress. After the class, universities can help students better consolidate the knowledge they have learned by offering ^[6]: Personalized practice recommendations (resources pushed based on preview quiz results); A submission portal for video assignments (where students upload videos of their practice); An online Q&A community (where teachers respond to questions within 24 hours).

3.2. Integrate diverse technologies to create high-quality digital resources

Colleges and universities can better develop high-quality digital resources for college swimming teaching by integrating diverse technologies. For instance, they can use high-definition video recording technology to film the standard movements of professional swimmers, allowing students to observe the details of the movements comprehensively ^[7]. When filming freestyle stroke movements, for example, colleges can adopt front, side, and top-down angles. This enables students to not only watch the swimmers' movements at normal speed and in slow-motion playback but also clearly see the coordinated cooperation between arm entry, stroke, exit, and body rotation. In addition, 3D animation technology can be used to simulate and analyze swimming movements, decomposing complex movements into multiple steps and presenting them in a dynamic form to help students understand the principles of the movements. When explaining the frog kick movement, for example, teachers can use 3D animations to show the contraction and extension process of leg muscles and their relationship with the forward movement of the body, allowing students to have a better learning experience. Furthermore, the integration of virtual reality (VR) and augmented reality (AR) technologies enables students to practice in a simulated swimming pool and better feel the resistance of water, thereby achieving a more immersive learning experience. Through these methods, colleges and universities can help students improve their understanding and mastery of swimming movements ^[8].

3.3. Constructing a blended teaching model to promote the effective application of digital resources

Colleges and universities can organically integrate online learning with offline resources. This enables students to better watch content such as movement demonstration videos and animation analysis, thereby understanding the basic essentials of swimming movements and theoretical knowledge ^[9]. For example, when teaching backstroke, teachers can ask students to pre-learn online knowledge about backstroke body postures, arm stroke paths, etc., and complete relevant online tests. Based on the test results, teachers gain an understanding of students' preview status, and then provide offline practical guidance, correct mistakes, and explain problems

encountered by students—all to improve students' comprehensive abilities. Through this teaching method, colleges and universities can not only enhance students' swimming skills but also boost their initiative in learning, making students more willing to engage in the learning process ^[10].

3.4. Establishing an evaluation and feedback mechanism to continuously optimize digital resources and teaching

Colleges and universities can establish an evaluation and feedback mechanism to better ensure the sustainability and effectiveness of the development and application of digital resources for swimming teaching. They can collect information regarding the content quality, technical performance, and usability of resources, as well as the teaching effectiveness of teaching models and students' learning experience, to gain a better understanding of teachers' teaching outcomes ^[11]. For instance, colleges and universities can regularly organize students to fill out online evaluation questionnaires to better understand their feelings about using digital resources, learning gains, and satisfaction with teaching content and methods—providing teachers with more targeted teaching strategies. They can arrange for teachers to share experiences and problems encountered in the blended teaching process, enabling teachers to conduct self-evaluation. They can invite experts in the field of physical education to conduct professional evaluations and guidance on digital resources and teaching models, so as to better update and optimize digital resources. This helps form a positive cycle and provides students with better learning resources ^[12].

4. Analysis of the application effect of digital resources in swimming teaching

4.1. Significant improvement in skill mastery and learning outcomes

In the evaluation of the application effect of digital resources in swimming teaching, skill compliance rate and movement standardization level are key indicators. By comparing the data of the experimental group and the control group, the significant role of digital resources can be clearly observed ^[13]. The 50-meter freestyle compliance rate of the experimental group reached as high as 85%, while that of the control group was only 65%, and this difference was statistically significant ($P < 0.05$). In terms of movement standardization scores, the average score of the experimental group was 8.2 points, and that of the control group was 6.7 points ^[14]. This fully indicates that digital resources, relying on their functions of precise movement demonstration and real-time feedback, enable students to observe and understand the details of swimming movements more clearly, effectively improving the quality of skill mastery. In terms of learning efficiency, the advantages of digital resources are also prominent. Students in the experimental group only needed an average of 8 class hours to master the core skill of breathing control, while the control group required 12 class hours. This is because digital resources have the feature of repeatable viewing—students can repeatedly watch teaching videos according to their own learning progress and needs, deepen their understanding and memory of key skills, and thus significantly shorten the skill acquisition cycle. Safety knowledge is an indispensable and important part of swimming teaching. In the safety test, the average score of the experimental group reached 92 points, and that of the control group was 78 points ^[15]. This benefit comes from the visual design of the safety module in digital resources: through vivid animations, videos, and other forms, safety knowledge and emergency response methods are intuitively presented to students, which enhances the learning effect and effectively reduces safety risks in the teaching process.'

4.2. Student experience and satisfaction

A questionnaire survey was conducted to understand students' experience and satisfaction with the digital

resources for swimming teaching. The results showed that 89% of the students in the experimental group believed that “slow-motion video analysis” was the most helpful for skill learning—slow-motion videos allow students to clearly see the subtle changes of each movement, which helps them better imitate and practice. Seventy-six percent of the students stated that the “online feedback function” helped them clarify the direction of improvement. The online feedback function can promptly point out the problems existing in students’ movements and provide targeted suggestions, enabling students to adjust and improve in a timely manner. In the satisfaction score, the resource practicality received 4.3/5 points, and the platform usability received 4.1/5 points, indicating that students have a high overall recognition of digital resources. However, 23% of the students also put forward some suggestions, such as hoping to add VR virtual swimming scenarios to allow students to practice in a more realistic environment, and optimizing the video loading speed to improve the fluency of learning.

4.3. Optimization directions for the blended teaching model

Combined with the above empirical results, the application of digital resources in swimming teaching needs to be optimized from two aspects: Firstly, hierarchical design of resources: At present, most teaching resources adopt a “one-size-fits-all” approach, which fails to fully consider the differences in students’ basic skills. Therefore, it is necessary to develop differentiated resource packages for students with no foundation and those with basic skills—providing more basic and detailed teaching content for beginners, and more challenging advanced content for students with basic skills. Secondly, strengthening online-offline linkage: Incorporate the problems identified in post-class video feedback into the key explanation content of in-class teaching. Specifically, collect the problems encountered by students in post-class practice through the online platform, and then conduct centralized explanation and demonstration in class, forming a closed loop of “online diagnosis—offline reinforcement” to further improve the teaching effect.

5. Conclusion

This study focuses on the development and application of digital resources in college physical education under the background of blended teaching, and conducts in-depth research with swimming teaching as an empirical case, achieving a series of valuable results. The digitalization of college physical education is an inevitable trend in the development of education. The development and application of digital resources for swimming teaching is only a starting point. On this basis, continuous exploration and innovation should be carried out to better promote the comprehensive digital transformation of college physical education.

Funding

General Project approved by the Beijing Association of Higher Education in 2024; Title: “Research on the Design and Application of Blended Teaching Mode to Enhance Autonomous Learning—Taking the Development and Application of Digital Teaching Resources for Swimming Courses as an Example”; Project Number: MS2024424.

Disclosure statement

The author declares no conflict of interest.

References

- [1] Wu HB, Zeng F, Wang H, et al., 2024, Research on the Dilemmas and Countermeasures of Digital Empowerment in College Physical Education Teaching. *Contemporary Sports Technology*, 14(30): 91–95.
- [2] Xu BW, Pang XZ, Chen ML, 2024, Construction and Experimental Research on the Process Evaluation System for Swimming General Courses in Physical Education Majors under Task-Driven Background. *Sports Quality*, 43(8): 1–4.
- [3] Xu J, 2024, Research on the Implementation Strategies of Curriculum Ideology and Politics in College Public Swimming Teaching. *Contemporary Sports Technology*, 14(14): 133–136.
- [4] Wang YH, 2024, Research on the Application of Blended Teaching Mode in Breaststroke Teaching for Dance Performance Majors at Xi'an Physical Education University, thesis, Xi'an Physical Education University.
- [5] Hao X, 2024, Exploration of Teaching Modes for College Swimming Courses in the New Era. *Sports World*, 2024(3): 77–79.
- [6] Du J, Zhu SL, 2023, Research on the Application Value and Strategies of Physical Fitness Training in College Physical Education Teaching. Guangdong Provincial Physical Fitness Association. Proceedings of the 9th China Physical Training Science Congress, 111–114.
- [7] Sun P, 2023, Research on the Similarities, Differences, and Complementarities Between College Physical Education and Sports Training. *Talent Development*, 2023(15): 93–95.
- [8] Yu Y, 2023, Research and Practice on the Application of “Internet+” Blended Teaching in Public Swimming Courses at Guangxi University, thesis, Guangxi University.
- [9] Hei HY, 2023, Research on the Application of the BOPPPS Model in Online Teaching of College Public Physical Education Courses, thesis, Jilin University.
- [10] Liu SS, 2024, Experimental Research on the Competition Teaching Method in Breaststroke Teaching for Swimming General Courses in Physical Education Majors, thesis, North University of China.
- [11] Liu J, Li YX, 2023, Research on the Correlation Between College Physical Education Teaching and Students' Physical Fitness Test Results. Proceedings of the 31st China University Track and Field Scientific Research Conference, 48–50.
- [12] Yu L, 2023, Research on the Teaching Evaluation System for Technical Courses in Physical Education Majors from the Perspective of Curriculum Ideology and Politics, thesis, Guizhou Normal University.
- [13] Chen YQ, 2023, Necessity Analysis of Virtual Simulation Experiments in Swimming Teaching for College Physical Education Majors. *Contemporary Sports Technology*, 13(7): 105–109.
- [14] Song RR, Dou HY, 2022, Research on the Path of Implementing the Integration of Physical Education and Education in College Swimming Curriculum Reform Under the New Curriculum Standards. Abstracts of the 4th International Aquatic Sports Forum: Forging Ahead in a New Journey-Promoting High-Quality Development of Youth and School Sports, 446–449.
- [15] Wang N, 2022, Dilemmas and Paths: Research on the Development Strategies of College Swimming Courses Under the Background of the Integration of Physical Education and Education in the New Era. Abstracts of the 4th International Aquatic Sports Forum: Forging Ahead in a New Journey-Promoting High-Quality Development of Youth and School Sports, 35–37.

Publisher's note

Bio-Byword Scientific Publishing remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Research on the Application of the Transparency Principle in the EU Artificial Intelligence Act

Mengting Zhu*

School of Law, Guizhou Normal University, Guiyang 550025, Guizhou, China

**Author to whom correspondence should be addressed.*

Copyright: © 2025 Author(s). This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0), permitting distribution and reproduction in any medium, provided the original work is cited.

Abstract: The EU Artificial Intelligence Act establishes the principle of transparency to ensure the traceability, interpretability, and communicability of artificial intelligence (AI) systems. This principle is reflected to varying degrees in AI systems of different risk levels, with particularly stringent requirements for high-risk AI systems. However, in practical application, the transparency principle faces multiple challenges, such as conflicts with trade secret protection, technical complexity, and ambiguous liability definition. Although the EU has adopted a series of specific provisions to ensure the implementation of the transparency principle, including requirements for information disclosure and documentation, these measures still need to further balance the interests of all parties during implementation to achieve the goal of promoting the healthy development of AI technology while protecting public rights and interests, social fairness, and justice.

Keywords: EU Artificial Intelligence Act; Transparency principle; Application issues

Online publication: September 18, 2025

1. Introduction

In recent years, with the vigorous development of artificial intelligence, its application in various fields has not only profoundly transformed people's work and life but also raised issues such as algorithmic discrimination, privacy infringement, and ambiguous liability attribution, which have made the public lack necessary confidence in AI. To address this, the European Commission officially published the Artificial Intelligence Act in March 2021, aiming to build a consistent regulatory framework compatible with EU common values^[1]. As an important basic principle of the EU Artificial Intelligence Act, the transparency principle can effectively overcome technical difficulties. By focusing on system traceability, interpretability, and communicability, it promotes public understanding and trust in technology and enhances the development level of technology. However, in practice, the transparency principle often faces many difficulties, and how to balance the legitimate interests of enterprises, technical barriers, and other issues has become one of the focuses in the field of AI at this stage.

2. Specific application of the transparency principle in the EU Artificial Intelligence Act

2.1. Application in AI systems of different risk levels

According to different risk levels, the EU Artificial Intelligence Act classifies AI systems into four categories: unacceptable risk, high risk, limited risk, and minimal risk. The transparency principle applies to systems of different risk levels to varying degrees. AI systems with unacceptable risks are explicitly prohibited from entering the market, and the transparency principle does not apply to them. High-risk systems are subject to the “absolutely acceptable transparency” principle, and strict and comprehensive transparency requirements must be reflected in the qualification requirements for high-risk systems to enter the market. AI systems must meet the technical documentation requirements specified in Article 11 of the Artificial Intelligence Act and satisfy all requirements set forth in Articles 8-15 of the Act^[2]; the system must be recognized by relevant parties capable of reasonably interpreting and applying output results, and it is stipulated that the ability must be reasonably designed to facilitate the performance of duties by providers and users; it must also be accompanied by a complete user manual including accurate and comprehensive information about features, functions, and all possible usage boundaries; the system must have the ability to automatically log all important events, and the event records must be detailed enough to facilitate supervision and verification. AI systems with limited risks shall fulfill their obligations of information disclosure and transparency. Even if the risk is very low, relevant affected parties must be informed transparently^[3].

2.2. Requirements for AI system providers and operators

In the EU Artificial Intelligence Act, both providers and operators have numerous transparency-related obligations. For providers, general-purpose AI model providers shall formulate and maintain technical documentation and provide information and documents to ensure transparency. For general-purpose AI models with systemic risks, providers shall conduct model evaluation and carry out adversarial testing, which shall be recorded in documents to identify and eliminate systemic risks. For example, providers of general-purpose AI models shall comply with transparency guidelines, take appropriate measures to ensure that no content violating EU laws is generated, and disclose data involving copyright used in training models. Operators also have numerous transparency obligations to fulfill. When operators interact directly with natural persons, they must ensure interaction with the AI system; when operating systems that generate synthetic information, operators shall require the output to be in a machine-readable format to ensure that synthetic content can be detected and identified as machine-generated or manipulated; when operating emotion recognition systems or biometric classification systems, operators shall inform contacts and process personal data; when operating systems that generate or manipulate deepfake content, operators shall disclose that the deepfake content is generated or manipulated by AI; when using systems to generate or modify text information involving public interest issues, disclosure shall be made, etc.^[4].

3. Problems in the application of the transparency principle

3.1. Conflict with trade secret protection

For AIGC companies, algorithms, data processing methods, and training data are important outputs of R&D investment and constitute key elements of trade secrets. Taking the unique algorithms and training data of image processing companies as an example, they are core to the company’s market competitive advantage.

However, in accordance with the transparency principle, such companies need to disclose summaries of training data, etc., which increases the risk of trade secret leakage and may weaken their competitiveness. For start-ups with insufficient resources, trade secrets are the foundation of their survival, and being forced to disclose core technologies may bring a survival crisis; large high-tech companies are also reluctant to disclose trade secrets, as this may weaken their core competitiveness^[5].

3.2. Implementation difficulties caused by technical complexity

Due to the high complexity of artificial algorithms, there are significant difficulties in the practical application of AI technology. Taking deep learning algorithms as an example, the operation model of such AI algorithms is trained with a large amount of sample data, and finally optimized and updated during the training process, and decision-making is based on training data. The operation process is cumbersome and complex, making it difficult to provide a simple explanatory analysis. For example, the AI algorithm model for deep learning image processing has numerous layers of operations, neuron nodes, and weighted changes. Changes in each neuron node will cause significant changes in results, making it almost impossible to provide explanatory analysis to ordinary users. The responsiveness of legal norms related to algorithm transparency does not match the highly complex characteristics of algorithms, making it difficult to effectively set clear and feasible standards for algorithm transparency systems.

3.3. Ambiguity in liability definition

The transparency of AI system decisions caused by algorithm operation among algorithm design, data provision, training models, human-computer interaction, and other steps makes it more difficult to allocate responsibilities. For example, it is difficult to distinguish whether the liability for a self-driving car accident is caused by data issues, algorithm problems, or human factors, which may easily lead to mutual shirking of responsibilities. The new technological revolution continues, resulting in delayed legislation, and there is still a lack of global standards worldwide. Due to different technical standards and regulations among countries, cross-border application becomes more difficult. The disconnection between technology and standards increases the difficulty of implementing the transparency principle, making it inconvenient to accurately identify responsible subjects and difficult to fully protect the interests of victims and guide technological development.

4. Suggestions for solving the application problems of the transparency principle

4.1. Measures to balance transparency and trade secret protection

At the legislative level, the Artificial Intelligence Act and supporting regulations should be refined to clarify the “necessary limits” of transparency disclosure. Drawing on the classified and hierarchical disclosure mechanism, core information can be divided into “mandatory disclosure items”, “limited disclosure items”, and “confidential items.” For example, the decision logic framework and data source categories of high-risk systems must be publicly disclosed, while core trade secrets such as specific algorithm parameters can be kept confidential but must be encrypted and filed with regulatory authorities. At the same time, exceptions to trade secret protection should be clarified. When decisions may cause significant harm, regulatory authorities have the right to require temporary disclosure and sign confidentiality agreements.

An independent committee composed of technical experts, legal experts, and industry representatives should be established to conduct specialized reviews of enterprises’ applications for trade secret protection.

Applicants for protection shall submit applications stating the reasons for protection and alternative disclosure methods, such as simple technical explanations or third-party inspections. The committee shall decide whether to grant protection within 15 working days and specify alternative disclosure methods or conduct regular inspections of confidential information ^[6].

Enterprises should establish a full-process information classification management system and mark public, internal shared, and core confidential information during the development stage. For information to be disclosed, “desensitized disclosure” should be adopted, such as disclosing the source field of training data rather than samples, and showing the weight trend of decision-influencing factors rather than specific parameters. A special information disclosure management department should be established, with technical, legal, and compliance personnel jointly reviewing the content.

Industry associations should be urged to issue guidelines on Transparency and Trade Secret Protection to determine disclosure norms and confidentiality limits ^[7]. For example, text-to-image AI should disclose data copyright compliance certification reports and technical principle summaries, while keeping key technologies confidential. Trade secret protection certification and industry-shared technology platforms should be established to provide services such as encrypted packaging and reduce the compliance costs for small and medium-sized enterprises.

4.2. Strategies to address technical complexity

Addressing technical complexity requires joint efforts of technological innovation and institutional innovation. Increase investment in explainable AI during technology R&D and develop corresponding explainable tools for different application scenarios. For “black-box” deep learning, develop model interpretability technologies to convert complex deep learning calculations into intuitive causal relationship diagrams. For example, AI products in the medical field use visualization methods to display key diagnostic data and weights. Develop modular algorithms, restrict high-risk systems to adopt detachable designs, and the functions and logic of each part of the algorithm are explainable. In the EU, special funds can be established to encourage research in this area, and rewards can be provided for technologies that achieve breakthroughs ^[8].

Develop transparency operation guidelines. From the perspective of the market and supervision, form flexible implementation guidelines for the transparency principle. According to the content of transparency implementation guidelines issued for different fields, there is generally room for annual revisions to incorporate newly emerging technologies. For example, for facial recognition technology, it is recommended to disclose key technical performance parameters and accuracy; for unmanned driving technology, it is recommended to record and retrieve decision parameters. Expressions should be “result-oriented” to avoid detailed provisions on technical details, and expert groups should review and revise them every 2 years ^[9].

Build a multi-participation technical verification mechanism and introduce third-party institutions to evaluate and certify the degree of transparency implementation. Verification institutions verify the authenticity of information disclosed by enterprises through technical testing, such as testing whether algorithm fairness is consistent with disclosed goals, and make the results public. The EU should establish an institution qualification certification system, clarify access norms, and penalty measures for violations.

Strengthen technical education and popular science, develop explanatory tools and materials for different groups, such as the “AI Decision Explanation Manual” for the public and technical training for supervisors. Incorporate basic AI courses into primary and secondary schools to cultivate public literacy. Encourage

enterprises to develop “user-friendly” interfaces and provide basic or professional hierarchical explanation functions.

4.3. Methods to clarify the liability definition

Building a liability identification mechanism requires innovations in the rule of law, mechanisms, and technology. When revising the Artificial Intelligence Act, a “full-life-cycle liability identification” model should be established to identify responsible subjects from three stages: design, R&D, deployment, and operation. Algorithm developers are responsible for algorithm safety and interpretability; data providers are responsible for data authenticity and compliance; deployers are responsible for scenario matching; operators are responsible for daily operation supervision. Implement the “liability ladder” principle, where liability weights are graded based on technical control capabilities and profit levels. In the fully autonomous driving mode, providers bear primary liability. If they fail to perform their duties without special reasons, they shall bear a certain proportion of liability, and circumstances such as unforeseeable technical vulnerabilities that mitigate legal liability should be specified.

Establish a liability identification standard committee involving multiple parties to formulate detailed standards and guidelines, and formulate judgment rules for high-risk application scenarios of medical AI. For example, AI diagnostic errors should consider the scope of use and the review of medical personnel. Extract key elements from typical cases and update them regularly to adapt to technological changes.

Implement third-party liability certification and traceability, promote blockchain full-life-cycle traceability, and record design parameters, data sources, and other information for accident traceability. For example, autonomous driving records software updates and decision data; develop intelligent liability identification to simulate liability proportions; the EU mandates that high-risk systems be connected to a unified platform and formulate technical and safety specifications.

Build a diversified dispute resolution mechanism, establish AI dispute mediation centers, special arbitration institutions, and specialized court tribunals, promote liability insurance systems, and insurance institutions set premium rates based on transparency and risks to encourage enterprises to improve their standards ^[10].

5. Conclusion

The transparency principle in the EU Artificial Intelligence Act plays a pivotal role in promoting technological development in the field of AI and protecting public interests. It has targeted and detailed application provisions for AI systems with different risk levels and provides detailed transparency requirements for providers and operators. However, in practical application, the transparency principle still faces problems such as balancing with trade secret protection, difficulties in implementation due to technical complexity, and an ambiguous liability definition. Reasonable measures can overcome these problems to a certain extent. However, it is worth noting that with the progress and development of AI technology, other problems will inevitably arise. For example, the transparency principle should be continuously considered and studied, and relevant policies and regulations should be continuously revised and improved to ensure their sound and effective implementation in the field of AI, promote the development of AI technology in a transparent and trustworthy environment, and achieve positive interaction between technological progress and social fairness, justice, and protection of public interests.

Disclosure statement

The author declares no conflict of interest.

References

- [1] Li XS, Li TK, 2025, On the Legal Risk Regulation of Artificial Intelligence Systems—Taking the EU Artificial Intelligence Act as an Example. *Journal of University of Science and Technology Beijing (Social Sciences Edition)*, 41(1): 86–102.
- [2] Han R, 2025, Copyright Challenges and Responses in the Era of Generative Artificial Intelligence—With Reference to EU Legislation. *Journal of Zhaoqing University*, 46(2): 45–53.
- [3] He ZH, 2025, The Product Safety Approach to Artificial Intelligence Legislation—A Critical Interpretation of the EU Artificial Intelligence Act. *SJTU Law Review*, 2025(1): 153–164.
- [4] Lu CY, 2025, EU Artificial Intelligence Strategy and Prospects for China-EU Cooperation in Artificial Intelligence Governance. *Contemporary World*, 2025(5): 31–36.
- [5] Liao XJ, Shi LD, 2025, Analysis of National Security Risks of the EU Artificial Intelligence Act from the Perspective of Externality. *Science and Technology Management Research*, 45(1): 238–245.
- [6] Du J, 2025, Innovation of EU Citizens’ Digital Competence Framework in the Context of Artificial Intelligence and Its Enlightenment. *Journal of Academic Library and Information Science*, 43(2): 131–139.
- [7] Gao ZH, Zhang XZ, 2025, Analysis of Policy Tools, Path Characteristics and Influences of the EU’s Participation in Global Artificial Intelligence Governance. *Forum on Science and Technology in China*, 2025(2): 150–160.
- [8] Zou J, Ji CY, 2025, The EU’s Approach to AI Risk Regulation and Its Enlightenment—Based on the Interpretation of the Artificial Intelligence Act. *Journalism Research*, 2025(1): 31–44 + 118.
- [9] Huang HY, Yang X, 2025, Interpretation of the EU Artificial Intelligence Regulatory System Based on the Artificial Intelligence Act. *Library Development*, 2025(1): 12–24.
- [10] Li KL, 2025, The Response and Effectiveness of the Artificial Intelligence Act to the Construction of EU Digital Sovereignty. *Journal of Political Science and Law*, 2025(2): 156–169.

Publisher’s note

Bio-Byword Scientific Publishing remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Exploring the Paths of Ideological and Political Education in the Recommendation System Course

Jianxi Zhao*, Qingrong Zou

School of Applied Science, Beijing Information Science and Technology University, Beijing 102206, China

**Author to whom correspondence should be addressed.*

Copyright: © 2025 Author(s). This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0), permitting distribution and reproduction in any medium, provided the original work is cited.

Abstract: Exploring the paths of ideological and political education in the recommendation system course can help to cultivate students' correct values and create a healthy social information environment. This paper is based on the task of cultivating virtue and nurturing people, and explores the corresponding paths of ideological and political education through analyzing the teaching problems and the teaching examples in the recommendation system course. Starting from the impact of outliers in collaborative filtering and the possibility of lying in explicit ratings, as well as the "cold start" Matthew effect and the user inertia in explicit ratings, two problem ideological and political paths — value orientation and moral literacy are respectively condensed. The study explores two example ideological and political paths — the Infiltration and Nurturing style and the Clarification-Actualization style, and provides the corresponding examples. This paper aims to provide a certain reference for cultivating high-quality talents with both morality and ability, and promote the ideological and political construction of recommendation system courses.

Keywords: Recommendation system; Curriculum ideological and political education; Paths; Ideological and political problems; Ideological and political examples

Online publication: September 18, 2025

1. Introduction

Recommendation systems aim to accurately push information that meets the interests and needs of users through algorithms and models. As an important direction in the field of artificial intelligence, recommendation systems have been widely used in many fields, such as the Internet, e-commerce, education and teaching, and many other fields, and have a profound impact on people's information acquisition, career development, consumption decisions, social interaction, and other aspects of work and life. Its influence is not only reflected in methods and technologies, but also extended to deeper social dimensions such as value guidance and cultural dissemination.

As an important measure to shape students' values, morals, and sense of social responsibility, ideological and political education runs through all stages and disciplines of education. Integrating ideological and political elements into the teaching of recommendation system courses is of great significance. From the perspective of students' personal development, this helps them train critical thinking and exercise the ability to make correct value judgments while they learn professional knowledge. These abilities can not only help students maintain a clear mind in complex information environments, but also lay a solid ideological foundation for their future career development and personal growth. From a societal perspective, cultivating professional talents with good ideological and political literacy can encourage recommendation systems to pay more attention to social value in their design and application processes, reduce the spread of harmful information, promote information equity, and contribute to creating a healthy and positive social information environment.

In the context of the rapid development of artificial intelligence, with the deepening of ideological and political construction in university courses, many artificial intelligence courses have undergone ideological and political research, such as artificial intelligence, pattern recognition, computer vision, image processing, deep learning, intelligent control, machine vision, information retrieval, and recommendation systems ^[1-13]. However, there is little research on the ideological and political development of recommendation system courses. The existing research on the ideological and political aspects of recommendation systems includes the ideological and political aspects of the deeds of some outstanding figures, the ideological and political aspects of certain examples, and the ideological and political aspects of several methods ^[12-13]. Many probability formulas and statistical analysis methods can be used in recommendation systems. The authors have done some work on the ideological and political aspects of probability formulas and statistical analysis methods ^[14-15]. Exploring the ideological and political elements in recommendation system courses has become a key problem that educators urgently need to address. This paper is based on the task of cultivating virtue and nurturing people. Through the analysis of teaching problems and teaching examples, it explores the corresponding paths of curriculum ideological and political education, providing useful references and inspirations for cultivating high-quality talents with both morality and ability. The ideological and political paths of the teaching examples in this paper are generalizations based on the ideological and political types of the teaching examples in the paper ^[12].

2. Ideological and political problems

In collaborative filtering, if recommendations rely on the most similar user, any quirks of that user will be recommended, namely, outliers may have a significant impact on the results. Ideological and political education: Behaviors or information that deviate significantly from mainstream values (outliers) may have a negative impact on people's thinking, distort cognition, and form negative values. Everyone exercises their own ability to identify beneficial information, so that even under the interference of negative information, one can adhere to the correct value orientation and code of conduct. Strengthening the training of critical thinking and improving students' ability to screen and judge information can help them maintain a clear mind and a calm attitude towards dealing with abnormal information.

In collaborative filtering (implicit rating and item-based filtering), Problem 1 of explicit rating is that users may lie or only provide partial information. Ideological and political education: Honesty and sincerity are the cornerstone and one of the core elements of personal morality, as well as an important spiritual force for promoting social harmony and progress. On a personal level, honesty and sincerity can not only help individuals

establish a good self-image, enhance self-esteem and confidence, but also earn the respect and trust of others, which is critical for building stable personal and professional relationships. At the societal level, whether it is commercial transactions, legal agreements, or daily communication, honesty and sincerity can reduce suspicion and conflict, and improve cooperation efficiency.

Extending the influence of outliers in collaborative filtering on recommendation results to the vigilance of ideological and political education against abnormal information that deviates from mainstream values, and exercising the ability to identify information and critical thinking; By the problem that users may lie about explicit ratings in collaborative filtering, emphasizing the importance of honesty and sincerity in personal morality and societal level. The path of ideological and political education for these types of problems can be summarized as value orientation.

In collaborative filtering (implicit rating and item-based filtering), Problem 2 of explicit rating is that most users are lazy and unwilling to rate items. Ideological and political education: Diligence is the core driving force for the Chinese nation to create material life and spiritual civilization, and it is also an important gene of excellent traditional Chinese culture. In the long river of history, the Chinese people, with the spirit of self-improvement and relentless struggle, have continuously improved their material and living conditions through hard work, nurturing a brilliant and splendid Chinese civilization. From the meticulous farming practices of ancient agricultural civilization to the innovative breakthroughs of modern industrial civilization, labor has always been present in the development history of the Chinese nation. It has not only created abundant material wealth but also cultivated the national character of mutual assistance, cooperation, unity, and progress through collective labor practice. This spiritual quality based on labor is not only an important support for the continuous development of Chinese civilization, but also provides a profound historical and cultural soil and spiritual nourishment for labor education in the new era.

Content filtering and classification (filtering based on item attributes) propose a collaborative filtering-based recommendation system problem: tending to recommend items that are already popular. Taking an extreme example, the authors consider a newly released album by a new band. Due to the fact that the band and album have never been overrated or purchased by anyone, if collaborative filtering is used, it will never be recommended, which is the “cold start” problem in recommendation systems and a typical Matthew effect phenomenon. Ideological and political education: Teachers emphasize the values of fairness and justice to students, and cultivate their sense of social responsibility and empathy. It promotes the development of students’ critical thinking, enabling them to identify and reflect on inequality phenomena in society and explore the ways to improve the situation of vulnerable groups. It advocates that everyone’s potential should be fully realized, providing equal development opportunities for all to reduce the negative impact of the Matthew effect.

The authors link the problem of user inertia of explicit rating in collaborative filtering to the significance of diligence. Based on the Matthew effect phenomenon of the “cold start” of collaborative filtering in recommendation systems, the authors emphasize the values of fairness and justice, cultivate a sense of social responsibility, and advocate equal development opportunities. The path of ideological and political education for these types of problems can be summarized as moral literacy.

3. Ideological and political examples

By designing teaching examples that combine cultural depth and practical significance, a teacher guides

students to elevate their cognitive understanding of specific value categories (such as historical culture, social achievements, collective spirit, and so on) into emotional identification and value internalization through example analysis. The path of ideological and political education in these types of examples can be summarized as the Infiltration and Nurturing style, which promotes the creative transformation of cultural genes and the conscious generation of value subjects. For example: (1) Reflection on the cultural perspective of music recommendation methods. Pandora achieves content filtering by analyzing over 400 features of music. If it is directly applied to the recommendation of traditional Chinese opera, it may lead to significant deviations in the recommendation of classic repertoire due to the use of Western feature systems such as “Tone Center” “Harmony Progression” and so on, while ignoring the unique feature systems of traditional Chinese opera such as “Beijing Opera Plate Style” “Kunqu Opera Sheet Style” and so on. This reveals the implicit cultural assumptions of recommendation methods, which require optimization and reconstruction of the feature systems, incorporating the unique feature systems of traditional Chinese opera, and reflecting respect for cultural diversity. (2) Comparative analysis of Chinese and Western groups. Using Naive Bayes to analyze voting data in the US Congress, students predict which political party the voting members belong to by voting “yes” or “no” on various bills. In contrast, China’s “Fengqiao Experience” emphasizes the concept of consultation and co-governance, while data mining for grassroots governance focuses more on features such as “the number of multi-party consultations” and so on, which reflect collective cooperation. Method design should be rooted in cultural soil, avoiding the simple application of Western “either this or that” logic, and highlighting the value concept of “consultation and co-governance” in Eastern wisdom.

By designing teaching contexts with value tension, a teacher guides students to use critical thinking tools to deconstruct and reconstruct value conflicts in multidimensional analysis (individual choices, social influence, and cultural roots), ultimately achieving the transformation from moral cognition to practical rationality. The path of ideological and political education in these types of examples can be summarized as the Clarification-Actualization style, aiming at cultivating discerning practitioners with cultural roots. For example: (1) The example of athlete classification implies the respect for differences and the pursuit of fairness: when classifying the sports activities that female athletes engage in, multiple characteristics such as height and weight are considered, which reflects the concept of respecting individual differences. Different people have different physical conditions and sports specialties. Using appropriate methods to analyze these differences, the authors can classify athletes, which reflects that respecting differences is essential for a more accurate understanding of things. At the same time, the purpose of classification is to fairly evaluate and predict. In the sports industry, fair competition is a core value, and scientific and reasonable classification helps athletes fully realize their potential in suitable projects. This is similar to the pursuit of fairness and justice in society, allowing everyone to play to their strengths in a suitable environment and obtain fair development opportunities. The importance of guiding students to respect differences and pursue fairness can help to cultivate their inclusive and diverse mindset, as well as their sense of responsibility to maintain fairness. When facing social phenomena, one should be able to think and treat differences from a more rational perspective and establish correct values. (2) Data mining goes beyond the application scope of methods and technologies, demonstrating a warm and profound sense of responsibility in social construction. Collaborative filtering may make popular products more popular and unpopular products less popular, thereby exacerbating the “Matthew effect”. This phenomenon is particularly evident in cultural dissemination — the works of niche artists may be difficult for the public to discover due to a lack of exposure. Developers should be aware that methods affect not only commercial interests, but also

cultural diversity and social equity. Pandora Music Station provides exposure opportunities for niche music by manually analyzing song features, which reflects the humanistic care behind technology. In addition, the applications of classification methods in fields such as medicine and finance also require developers to have a sense of social responsibility and avoid method bias from causing harm to certain groups. The ultimate goal of methods and technologies is to serve humanity, therefore, it is necessary to go beyond methods and technologies themselves, consider their social impacts, and ensure that technological progress benefits everyone, rather than exacerbating inequality. Excellent programmers are like empty tea cups. Only by maintaining an open mindset and paying attention to the social value of methods and technologies can we truly unleash the potential of data.

4. Conclusions

Exploring the paths of ideological and political education in the recommendation system course is of great significance for students' personal development and the creation of a social information environment. By analyzing the ideological and political teaching problems in the recommendation system, the authors explore two paths of ideological and political education: value orientation and moral literacy. By analyzing the ideological and political teaching examples in the recommendation system, the authors explore two paths of ideological and political education: the Infiltration and Nurturing style and the Clarification-Actualization style. Through the research presented in this paper, the authors aim to promote the construction of ideological and political education in recommendation system courses, closely integrate professional knowledge of recommendation systems with ideological and political education, cultivate high-quality talents with solid professional knowledge and good ideological and political literacy, and help to create a favorable social information environment.

Funding

This paper is funded by the Young Backbone Teacher Support Plan of Beijing Information Science & Technology University (Project number: YBT 202445), the 2023 University-Level Curriculum Ideological and Political Education Reform Project of Beijing Information Science & Technology University, whose title is "Exploration and practice of curriculum ideological and political education of text data analysis and recommendation system" (Project number: 2023JGSZ24), and the 2025 University-Level Curriculum Ideological and Political Education Reform Project of Beijing Information Science & Technology University, whose title is "Research on the integration of science and education and that of ideological and political education about statistical analysis methods in the era of digital intelligence" (Project number: 2025JGSZ24).

Disclosure statement

The authors declare no conflict of interest.

References

- [1] Zhou ZX, 2025, The Implication, Design, and Practice of Ideological and Political Education in Artificial Intelligence Courses. *Computer Education*, 2025(4): 171–176.

- [2] Wen J, Xu Y, 2023, Research on Case Design of Ideological and Political Education in Pattern Recognition Course. *Higher Education Journal*, 9(12): 46–49.
- [3] Luo XQ, Wang J, Xu TY, et al., 2024, Exploration and Practice of Curriculum Ideological and Political Construction of “Computer Vision”. *Education and Teaching Forum*, 2024(47): 5–8.
- [4] Shen GL, Ping ZY, Zhang R, 2024, Exploration and Practice of Curriculum Ideological and Political Education of Image Processing Technology. *Industry and Technology Forum*, 23(7): 191–193.
- [5] Gao ZJ, Li Y, Shi JT, 2024, Research on the Case Construction and Talent Cultivation of Curriculum Ideological and Political Education of Deep Learning in the Era of Artificial Intelligence. *Economist*, 2024(5): 168–170.
- [6] Pan TH, Fan Y, Zhang DX, 2025, Exploration and Practice of Curriculum Ideological and Political Elements of “Intelligent Control”. *Journal of Electrical and Electronic Teaching*, 47(1): 175–178.
- [7] Huang YB, Liu XY, Xu XQ, 2024, Practice and Its Integration of Ideological and Political Education of Full English Curriculum Construction of “Principles and Applications of Machine Vision”. *Industry and Information Technology Education*, 2024(10): 34–38.
- [8] Yang XQ, Yang XB, Sun KK, 2025, Incorporating Ideological and Political Education into Curriculum Construction of “Machine Vision”. *Heilongjiang Education (Theory and Practice)*, preprint, 1–4.
- [9] Tu F, 2025, Teaching Research on Integrating Curriculum Ideological and Political Education into “Information Retrieval and Utilization” Course. *Science Consulting*, 2025(4): 138–141.
- [10] Ding Y, Li L, Zhang DR, 2024, Exploration and Practice of Integrating Curriculum Ideological and Political Education into “Science and Technology Information Retrieval and Utilization” Course. *Library and Information Work*, 68(22): 73–80.
- [11] Liu L, Cui Y, 2022, Teaching Reform and Practice of “Curriculum Ideological and Political Education” of Information Retrieval Course. *Journal of University Library and Information Science*, 40(2): 87–91.
- [12] Zhao JX, 2023, Ideological and Political Exploration for Teaching Contents of Recommendation System Course. *Modern Management Forum*, 7(12): 230–232.
- [13] Zhao JX, 2024, Ideological and Political Exploration for Some Recommendation Methods. *Modern Management Forum*, 8(4): 122–124.
- [14] Zhao JX, Zou QR, 2024, Ideological and Political Exploration for Probability Formulas. *Education Reform and Development*, 6(10): 169–173.
- [15] Zhao JX, 2025, Ideological and Political Exploration for Multivariate Statistical Analysis Methods. *Education Reform and Development*, 7(1): 259–263.

Publisher’s note

Bio-Byword Scientific Publishing remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Research on the Reform Path of College Physical Education from the Perspective of Physical Health

Wuqi Zhao*

Department of Physical Education, Beijing International Studies University, Beijing 100024, China

**Author to whom correspondence should be addressed.*

Copyright: © 2025 Author(s). This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0), permitting distribution and reproduction in any medium, provided the original work is cited.

Abstract: In recent years, the physical fitness of college students has shown a downward trend, which not only affects their physical and mental health but also restricts the development of society and the country. From the perspective of physical health, this study starts with the physical health problems of college students and conducts research on college physical education. It is believed that college physical education should keep pace with the times, reform and innovate in a timely manner, continuously improve the effect and quality of physical education, enhance college students' physical fitness, and improve their health level. In this regard, this paper analyzes the reform path of college physical education from the perspective of physical health, hoping to provide a basis for college physical education reform and a reference for college physical education practitioners.

Keywords: Physical health; Colleges and universities; Physical education; Teaching reform

Online publication: September 18, 2025

1. Introduction

According to the Survey Report on the Health Status of Chinese College Students released by the Ministry of Education, the data of college students' physical health tests in China show a downward trend. In terms of health problems, issues such as eyesight, body shape, and psychology among college students have become increasingly prominent, which deserve social attention and reflection. In this context, from the perspective of physical health, college physical education should play a positive role in promoting college students' physical health. Physical education should keep pace with the times, reform and optimize physical education in a timely manner, continuously improve the effect and quality of curriculum teaching through various methods and means, strengthen students' physical fitness, and lay a good foundation for promoting their all-round development and adaptation to society.

2. Current situation of college physical education

2.1. Curriculum setting

College physical education is mainly based on traditional models. The curriculum setting has not kept pace with the times, still focusing on traditional sports such as football, volleyball, and swimming, and lacking innovation. At the same time, some college physical education teachers still adopt traditional and single teaching models and methods, mainly focusing on explanation and demonstration, with little interaction and communication with students in class. Students are often in a passive acceptance state, which is not conducive to giving play to their initiative and cultivating interest in physical education, thus affecting the effectiveness of physical education. In addition, the proportion of physical education class hours is relatively low, and the curriculum content has the phenomenon of “valuing skills over knowledge”, which also affects students’ learning effect and the formation of sports habits.

2.2. Teaching resources

According to data, there are problems such as uneven distribution of college physical education resources and a shortage of some sports resources. Physical education resources are necessary for schools to carry out sports activities and are directly related to the quality of physical education. Physical education resources mainly include teacher resources, teaching equipment, sports venues, facilities, etc. ^[1]. In terms of teacher resources, the age structure, educational background structure, and professional structure of the physical education teacher team in some colleges and universities are unreasonable. Some teachers have outdated teaching concepts and single teaching methods, lacking mastery and understanding of new things, such as ideological and political classrooms, mixed teaching models, and artificial intelligence teaching methods in recent years. These teachers have not actively learned and mastered them, and their teaching level needs to be improved. In terms of teaching equipment, physical education equipment is incomplete and lacks maintenance, resulting in aging and damage to some sports equipment, which cannot meet the teaching needs and even poses potential safety hazards. In terms of sports venues and facilities, there is a shortage of sports venues and lagging construction, which makes it difficult to meet the needs of physical education and students’ physical exercise. These situations in teaching resources have affected the development of college physical education to a certain extent. How to rationally allocate and efficiently use teaching resources is a key issue in the development of college physical education.

2.3. Evaluation system

At present, the physical education curriculum evaluation in some colleges and universities uses students’ physical examination results as the evaluation method, and the evaluation content is mainly based on students’ performance and sports skill test results. The evaluation method is mainly teacher evaluation of teaching, which is relatively single and cannot fully and adequately reflect students’ physical learning effects and physical fitness ^[2]. Evaluation should have a guiding and incentive role. The evaluation in college physical education should also follow this principle. In evaluation, it is necessary to form an objective evaluation system, including as comprehensive evaluation content as possible, such as attitude, knowledge, physical fitness, skills, etc., and also consider students’ individual differences and process changes in participating in physical education. Only in this way can the function of evaluation be better exerted and urge students to actively participate in sports activities.

3. Analysis of the causes of the decline in college students' physical health

3.1. Social development factors

The development of society and the application of scientific and technological achievements have changed people's lifestyles. The current society has entered the information age, and people's lives have been greatly facilitated due to the development of information technology. College students are also in this era background, and the information network has become an important part of their daily lives ^[3]. While college students enjoy the convenience brought by the information network, there are also some adverse effects. For example, some college students invest too much time and energy in online games and virtual social interactions, leading to phenomena such as long-term bad posture, excessive eye use, and psychological emptiness. At the same time, college students are often under great study pressure, and long-term life and study pressure puts them in a state of tension, which further affects their physical health.

3.2. Physical education factors

Schools are the main places responsible for promoting the development of students' physical health, and college students' physical health level is affected by college physical education factors. At present, some college physical education teachers still adopt a single teaching model, focusing on sports skills and sports training, while ignoring students' individual needs ^[4]. In teaching practice, teachers do not fully respect students' differences, often adopt unified teaching methods and standards, and carry out curriculum teaching in a "one-size-fits-all" way, resulting in difficulty in meeting the personalized needs of different students. This single teaching model is difficult to effectively stimulate students' interest in learning, and easily makes them have a resistance to participating in sports activities, thus affecting the effectiveness of physical education. At the same time, the evaluation mechanism in physical education cannot effectively encourage college students to participate in sports. The evaluation of physical education courses in most colleges and universities is only an evaluation of the results of students' courses, ignoring the evaluation of the students' learning process. Some students have made great efforts in physical education classes, but due to a lack of physical fitness or sports skills, they cannot achieve the expected results. This kind of evaluation will affect students' enthusiasm for participating in sports.

3.3. Individual factors

In middle school, college students often cannot focus on physical exercise due to exam pressure. This leads to college students not mastering proficient sports skills and knowledge after entering college, and not having the foundation to participate in sports activities. At the same time, problems such as sitting for a long time, excessive eye use, high psychological pressure caused by academic pressure, and bad habits such as excessive use of electronic devices, irregular diet, and work and rest further lead to college students' physical health problems.

4. Reform strategies of college physical education from the perspective of physical health

4.1. Physical education teaching reform

4.1.1. Changing teaching concepts

Traditional teaching concepts are difficult to arouse college students' enthusiasm for participating in physical education and cannot well promote the development of college students' physical health. To ensure college

students' physical health, teachers must first change teaching concepts. In college physical education, teachers should establish the teaching concepts of "people-oriented" and "health first", clarify students' dominant position in the physical education process, promote students' interest in participating in physical education, let students realize the positive impact of physical education on physical health, and establish correct physical education concepts.

4.1.2. Innovating teaching models

From the perspective of physical health, college physical education work should innovate in teaching models. On the one hand, it is necessary to further enrich the project settings, curriculum content, and teaching methods. For example, according to students' needs, offer emerging sports projects such as extreme sports, roller skating, and frisbee. On the other hand, integrate multi-disciplinary theories and apply modern scientific and technological achievements, such as sports applications and wearable sports devices. At the same time, mixed teaching combining online and offline can be carried out. Mixed teaching refers to the organic combination of the advantages of online teaching and traditional classroom teaching, which includes two parts: online teaching and offline teaching. Online teaching can provide rich learning resources with the help of network resources and technology. Offline teaching mainly adopts traditional teaching activities, and teachers can guide students according to teaching goals and actual needs. Mixed teaching not only gives play to the leading role of teachers in guiding, inspiring, and monitoring the teaching process but also fully reflects the initiative, enthusiasm, and creativity of students as the main body of the learning process.

4.1.3. Changing curriculum structure

The reform of physical education should start with the setting of physical education courses and the scientific and reasonable selection of teaching content to achieve higher teaching efficiency and better teaching quality. The reform of physical education content and curriculum setting should be based on the overall and phased goals of school physical education, the needs of social development, students' personalized needs, and venues and facilities, and establish the guiding ideology of enhancing physical fitness and promoting all-around physical and mental development.

In view of the problem that the proportion of physical education class hours is relatively small, colleges and universities should reform the curriculum structure and appropriately increase the class hours of physical education courses. For example, in the university stage, the physical education content and curriculum setting model are compulsory courses for the first and second grades, and after-school sports associations and sports clubs are set up to allow students to choose according to their own situation and interests. At the same time, theoretical teaching should be closely combined with practical teaching to strengthen students' cognition and help them establish health concepts. Educators can broaden students' knowledge and establish health concepts by organizing and carrying out theme lectures on health knowledge, sports injuries, and rehabilitation.

4.1.4. Implementing stratified teaching

In order to improve the teaching effect of physical education courses, teachers should divide students into different levels according to their interests, physical fitness, and sports level, and formulate targeted teaching goals and teaching content to improve teaching pertinence and better meet the diversified needs of students at different levels^[5]. For example, in football classes, teachers can divide students into two levels, Level 1 and

Level 2, according to their ability. In the teaching process, there are differences in teaching content, teaching methods, and exercise load, and teaching suitable for different levels can better promote the development of students' physical health ^[6].

4.2. Stimulating students' interest in physical education participation

4.2.1. Assistance from scientific and technological achievements

In the context of educational informatization, teachers can introduce modern information technology into physical education courses, and with the help of the powerful functions of information technology, enrich teaching content, expand teaching forms, and improve the teaching effect of courses. For example, in the practice of physical education teaching, teachers can use multimedia methods to show students the essentials of sports movements and play demonstration videos, so that students can learn and master sports skills more intuitively and specifically, and improve their sports level; they can also use online teaching platforms to carry out online teaching and tutoring for students, so as to break through the limitations of traditional teaching practice and space and improve the teaching effect of courses. In addition, virtual reality, augmented reality, and other technologies can be introduced into teaching to stimulate students' interest, mobilize their enthusiasm, and more effectively improve the teaching effect of courses ^[7]. For example, in taekwondo teaching, taekwondo teaching in the virtual world can be realized through virtual reality technology and wearable devices. In specific operation, students can carry out technical exercises and virtual battles by wearing devices, and the system can evaluate students' taekwondo technical level and virtual battle situation, which can better stimulate students' interest under the premise of safety and effectiveness.

4.2.2. Enriching teaching methods

Teachers can choose appropriate teaching methods in physical education according to the teaching content and students' actual situation. In actual physical education teaching, the game method and competition method are effective methods to stimulate students' participation in physical education ^[8]. The game method displays the teaching content in the form of games to stimulate students' participation interest and achieve the goal of improving their physical health. For example, in physical education classes aimed at promoting students' speed and endurance development, games such as variable-speed running and sticker can be used to make the originally boring exercises interesting, which helps to stimulate students' interest in participating in physical education and complete teaching tasks. The competition method is carried out in the form of group competitions to stimulate students' competitive spirit, so as to improve their physical health and cultivate their will quality. For example, in football classes, traditional dribbling and ball control teaching mainly uses teachers' explanation and demonstration of technical actions, and students practice repeatedly through specified routes. This mechanical repetitive practice is difficult to attract students' enthusiasm. At this time, the competition method can be used, dividing students into two opposite groups, with one person dribbling and attacking and one person defending, practicing in a one-on-one form. In this way, it can not only exercise students' dribbling and ball control ability but also cultivate their sense of competition.

4.3. Integrating educational resources

4.3.1. Teacher resources

Teachers are not only important organizers and participants of curriculum teaching but also important forces

to promote teaching reform. In this regard, colleges and universities should strengthen the construction of the teacher team and continuously improve teachers' professional quality and comprehensive ability. Specifically, on the one hand, educators should do a good job in talent introduction, such as introducing high-level talents or excellent retired athletes to teach in the school, so as to improve the professional level of the teacher team. On the other hand, educators should regularly organize activities and training to improve teachers' comprehensive quality, innovate teachers' concepts, and encourage teachers to continue learning and keep pace with the times.

4.3.2. Sports venues and facilities

Colleges and universities should increase investment in sports venues and facilities, actively carry out venue construction, enrich school venue resources, and provide guarantees for promoting the reform of physical education courses. At the same time, schools can reasonably allocate existing venue resources. In addition to teaching, venue resources can be provided to students through an appointment system, facilitating students to carry out physical exercise in their spare time, which is conducive to promoting the development of students' physical health.

4.3.3. Teaching equipment

Colleges and universities should standardize the purchase and maintenance methods of equipment, timely supplement physical education equipment, and carry out regular maintenance, so as to better meet the needs of physical education. For aging, outdated equipment, and a shortage of equipment, the corresponding equipment should be fully equipped according to curriculum needs. At the same time, there should be special personnel responsible for the management and maintenance of equipment to ensure its safety and reliability and avoid safety problems.

4.4. Improving the evaluation system

Teaching evaluation is an important means of obtaining feedback information. Teachers evaluate students' learning, so that each student can set new goals and new motivations from the teaching evaluation. Through students' evaluation of teachers' teaching, teachers are promoted to scientifically arrange and control the teaching process.

The traditional college physical education evaluation system can no longer meet the needs of students' development^[9]. In order to improve the quality of physical education teaching and the physical health level of college students, it is necessary to build a more perfect and objective physical education teaching evaluation system. First, in physical education teaching, information technology can be used to monitor the implementation data. For example, wearable devices can be used to collect real-time data of students during exercise, analyze heart rate, blood sugar, and sports performance, which helps to grasp students' situation in a timely manner. Second, physical education evaluation should change from "valuing results and skills" to "valuing process and comprehensiveness", and a multi-dimensional and multi-level evaluation system should be built to truly realize "promoting learning through evaluation" and "promoting teaching through evaluation", helping to improve curriculum teaching and students' physical health development^[10].

5. Conclusion

In short, from the perspective of physical health, colleges and universities should reform and optimize

traditional physical education, improve the effect and quality of physical education through various methods and means, ensure the development of college students' physical health level, establish college students' sports habits, and lay a solid foundation for their future entry into society.

Funding

This paper is a research result of the 2025 Teaching Reform Project of the Department of Physical Education, Beijing International Studies University, entitled "A study of the effects of after-school exercise on college students' sports participation and physical fitness level."

Disclosure statement

The author declares no conflict of interest.

References

- [1] Song YL, 2025, Exploration on the Optimization Path of College Physical Education from the Perspective of Integration of Sports and Education. *Learning Weekly*, 2025(12): 7–9.
- [2] Lu YH, 2025, Dilemma, Value Implication and Practical Path of College Physical Education Reform in the New Era. *Contemporary Sports Technology*, 15(7): 27–30.
- [3] Xiong SB, Zhu R, 2025, Research on Public Physical Education in Colleges Based on Physical Health Test Data and Countermeasures — A Case Study of Hunan Agricultural University. *Journal of Taiyuan Urban Vocational College*, 2025(1): 77–80.
- [4] Guo ZX, Xu WY, 2023, Research on the Development Path of College Physical Education from the Perspective of Healthy China — A Case Study of Jiangsu Province. *Ice and Snow Sports Innovation Research*, 2023(21): 144–147.
- [5] Yin J, 2021, Research on the Evolution of College Physical Education Reform from the Perspective of Students' Physical Health. *Ice and Snow Sports Innovation Research*, 2021(13): 109–110.
- [6] Hou K, 2019, Research on Stratified Teaching Methods in College Football Courses. *Contemporary Sports Technology*, 9(11): 137–138.
- [7] Wang DP, 2021, Research on the Innovative Development of College Physical Education under the Background of "Internet +". *Contemporary Sports Technology*, 11(16): 107–109.
- [8] Hao ZP, 2020, Research on College Physical Education Methods under the Concept of Innovative Education. *Bulletin of Sport Science & Technology*, 28(3): 37–46.
- [9] Dong RF, 2019, Analysis on the Reform Path of College Physical Education from the Perspective of College Students' Physical Health. *New West*, 2019(3): 162–165.
- [10] Yu SM, 2014, Problems and Preliminary Conception in Establishing the Evaluation Standard System of Physical Education Teaching Quality. *Journal of Physical Education*, 21(3): 95–99.

Publisher's note

Bio-Byword Scientific Publishing remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Research on the Path of Implementing “Classroom Revolution” in Specialized Basic Courses of Higher Vocational Colleges: A Case Study of the Course “Fundamentals and Applications of Finance”

Jiangbo Wang, Songbin Wu*, Qi Liao

Shenzhen Polytechnic University, Shenzhen 518055, Guangdong, China

**Author to whom correspondence should be addressed.*

Copyright: © 2025 Author(s). This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0), permitting distribution and reproduction in any medium, provided the original work is cited.

Abstract: Classroom Reform stands as a pivotal initiative for implementing the Action Plan for Enhancing Quality and Excellence in Vocational Education and deepening the “Three-Education Reform” (targeting teachers, teaching materials, and teaching methods). Using Fundamentals and Applications of Finance as a representative case, this study addresses prevailing pain points and systemic bottlenecks in specialized foundational course instruction. It proposes a “Five-in-One Integration, Three-Dimensional Drive, Six-Step Interaction” implementation pathway for Classroom Reform, providing actionable guidance for Higher Vocational Colleges to advance pedagogical transformation. Key innovations include: Integrated curriculum-politics system: A finance-oriented ideological and political education framework is holistically constructed through coordinated development of curriculum design, pedagogical models, resource development, assessment systems, and faculty capacity building, thereby fulfilling the fundamental mission of fostering virtue through education. Three-dimensional content reconstruction: Teaching content is restructured across work tasks, application scenarios, and learning outcomes dimensions, driving deep convergence of “industry requirements, curricular standards, skill competitions, and professional certifications” (Gang-Ke-Sai-Zheng). Interactive pedagogical architecture: A six-step interactive teaching cycle (“Clarify, Analyze, Explore, Practice, Evaluate, Extend”) is implemented, establishing a closed-loop smart classroom ecosystem featuring pre-class intelligent diagnostics, in-class interactive engagement, and post-course digital competency profiling. This comprehensive approach reconstructs a dynamic educational ecology, demonstrating a replicable model for vocational education reform.

Keywords: Higher vocational colleges; Classroom Revolution; Implementation path; Specialized basic courses

Online publication: September 18, 2025

1. Background of implementing “Classroom Revolution” in higher vocational colleges

“Classroom Revolution” is the core content of higher vocational teaching reform and a key entry point and

foothold for enhancing the adaptability of vocational education ^[1]. The Ministry of Education's Action Plan for Enhancing Quality and Excellence in Vocational Education (2020-2023) (Jiaozhi Cheng [2020] No.7) clearly proposes to implement the "Three Education Reforms" in vocational schools, promote the "Classroom Revolution" in vocational schools, adapt to the characteristics of diverse student sources, and push curriculum teaching reform to a deeper level.

Therefore, carrying out the "Classroom Revolution" in higher vocational colleges is a reform in vocational education concepts, models, teaching content, and teaching environment. It is the core content of promoting teaching reform in higher vocational colleges, and also a specific measure to implement the president of the CPC's proposal of "what kind of people to cultivate, how to cultivate them, and for whom to cultivate them" ^[2-4].

Courses are the carrier of implementing the "Classroom Revolution." Only when teaching reform effectively penetrates into the curriculum level can it truly enhance the adaptability of vocational education and improve the quality of talent cultivation. Therefore, taking the specialized basic course "Fundamentals and Applications of Finance" for the Financial Technology Application major as an example, this paper follows the reform mainline of "ideological and political education throughout the course, digital technology empowerment, integration of post-course-competition-certificate, and innovation of teaching mode." Through the integrated design of a finance-characteristic curriculum ideological and political system, the development of new-form textbooks to reconstruct teaching content, the integration of BOPPPS concept to innovate teaching mode, and the building of a closed-loop smart classroom, it comprehensively promotes the "Three Education Reforms" and proposes a "Five-in-One Integration, Three-Dimensional Drive, Six-Step Interaction" implementation path for "Classroom Revolution", aiming to provide a reference for higher vocational colleges to deepen classroom reform.

2. Necessity of implementing "Classroom Revolution" in specialized basic courses

Specialized basic courses are characterized by a strong theoretical nature, abstract content, and separation from practical needs, leading to pain points in classroom teaching such as "rigid integration of ideological and political education, dull and monotonous classrooms, insufficient digital empowerment, and shallow integration of post-course-competition-certificate." Against the background of the rapid iteration of AI technology and digital transformation, specialized basic courses represented by "Fundamentals and Applications of Finance" urgently need to solve the pain points and bottlenecks in classrooms through the "Classroom Revolution" ^[5-6].

2.1. Rigid integration of curriculum ideological and political education

The teaching design of curriculum ideological and political education has a "two skins" phenomenon, manifested as random embedding of ideological and political elements and a lack of systematic design in teaching implementation. The development of the "Red Finance" teaching resource database is insufficient, lacking professional characteristic cases, and "Chinese financial stories" have not been fully explored ^[7-9]. Therefore, it is necessary to design the curriculum ideological and political system in an integrated manner from curriculum design, teaching mode, resource construction, evaluation system, and teacher development to solve the problem of rigid integration and improve the effectiveness of moral education.

2.2. Shallow integration of "Post-Course-Competition-Certificate"

Textbook content lags behind new businesses, new scenarios, and new standards, and is disconnected from the

development needs of the financial industry. Classrooms lack real business scenarios, and teaching is separated from practical scenarios. The teaching content provides insufficient support for students' participation in competitions and certificate examinations, and the characteristics of outcome-oriented vocational education are not fully reflected^[10-11]. Therefore, it is urgent to take the opportunity of reconstructing teaching content to strengthen the integration of "post-course-competition-certificate" from three dimensions: work tasks, application scenario driving, and learning outcomes by accurately linking typical tasks of job positions, vocational skill competition scenarios, and vocational skill certificate standards.

2.3. Imbalanced classroom ecology

Classrooms of specialized basic courses mostly adopt one-way lecturing and indoctrination, suppressing students' initiative, resulting in generally low participation in interactions, and learning effects not being timely fed back and consolidated. The lag in the construction of smart classrooms is also an important reason for dull and monotonous classrooms and ecological imbalance^[12]. Therefore, it is urgent to introduce the BOPPPS concept to reconstruct the teaching organization form, strengthen teacher-student interaction and feedback through "six-step interaction", and create a vibrant classroom ecology by building smart classrooms^[13].

3. Implementation path of "Classroom Revolution" in specialized basic courses

Adhering to the student-centered educational philosophy, with the reform mainline of "ideological and political education throughout the course, digital technology empowerment, integration of post-course-competition-certificate, and innovation of teaching mode", and taking "Five-in-One Integration, Three-Dimensional Drive, Six-Step Interaction" as the specific implementation path, the "Classroom Revolution" is promoted in depth by building a "Five-in-One" finance-characteristic ideological and political system, reconstructing teaching content with "Three-Dimensional Drive" for in-depth integration of "post-course-competition-certificate", and empowering with digital technology to build BOPPPS smart classrooms^[14-15].

3.1. Deepening curriculum ideological and political education, building a finance-characteristic ideological and political system with "Five-in-One Integration"

"Five-in-One Integration" refers to the integrated design of a finance-characteristic curriculum ideological and political system from five aspects: curriculum design, teaching mode, resource construction, evaluation system, and teacher development.

3.2. Optimizing curriculum design

Customize operable ideological and political goals and integration points for curriculum project modules, focusing on clear requirements such as ideals and beliefs, emotional identification with the "Four Confidences", craftsmanship spirit, family and country feelings, and sense of historical mission. Build a clear ideological and political value chain, closely integrate value shaping, knowledge imparting, and ability training, and tell "Chinese financial stories" throughout the teaching implementation to exert the subtle educational effect of ideological and political education through the whole-process infiltration.

3.3. Reconstructing teaching mode

Build an ideological and political smart classroom relying on teaching platforms, new-form textbooks, and

digital resources to expand the breadth, depth, and warmth of integrating ideological and political elements with professional knowledge. Adopt the situational teaching method, case teaching method, and PBL group activity method to organically integrate ideological and political connotations into situational teaching. Guide students to think deeply about hot issues and moral and ethical issues in the financial field through interactive methods such as simulating real scenarios, creating problem situations, and case discussions, and produce visible learning outcomes in combination with ideological and political goals.

3.4. Exploring ideological and political resources

Focus on improving the “Red Finance” ideological and political resource database and telling “Chinese financial stories.” Collect and sort out contemporary Chinese financial practices and red financial historical materials around curriculum project modules, introduce online resources such as the National Museum and “Learning Power”, condense professional characteristic ideological and political cases, and extract unique Chinese-style financial ideological and political elements to provide resource support for the realization of curriculum ideological and political goals and teaching implementation.

3.5. Improving the evaluation system

The evaluation system is an important means to test the effectiveness of the curriculum ideological and political education. Through the integrated design of a diversified whole-process evaluation system that integrates knowledge, skills, and quality goals, strengthen the organic combination of process evaluation and summative evaluation. Specific evaluation methods are not limited to objective forms such as test questions, but focus more on subjective learning outcomes such as theme discussions and research reports, fully reflecting students’ ideological and political learning trajectory and growth changes.

3.6. Strengthening teacher strength

Teachers are the key to the implementation of curriculum ideological and political education, and strengthening teacher strength is an inevitable requirement to improve the effectiveness of curriculum ideological and political education. Adopt the “external introduction and internal connection” method to form a curriculum ideological and political teaching team, regularly participate in ideological and political education special training activities, share curriculum ideological and political construction experience, and improve teachers’ ideological and political literacy and teaching ability. Strengthen inter-school exchanges and cooperation by organizing ideological and political teaching seminars and building teaching practice platforms.

4. Focusing on content reconstruction, “Three-Dimensional Drive” for in-depth integration of “Post-Course-Competition-Certificate”

“Three-Dimensional Drive” refers to reconstructing teaching content from three dimensions: work tasks, application scenarios, and learning outcomes, and taking the development of new-form textbooks as the starting point to deeply integrate “post-course-competition-certificate.”

4.1. Extracting typical tasks

Connect with the core target job groups in the financial industry, extract typical work tasks with reference to national vocational standards, and realize the organic connection between classroom teaching knowledge

modules and the knowledge, ability, and literacy requirements of vocational positions through iterative updating of curriculum standards, teaching content, and course lesson plans, so as to promote “post-course integration” through typical work tasks.

4.2. Creating application scenarios

Introduce competition modules in vocational skill competitions such as “Smart Finance” and “Comprehensive Banking Business Skills”, organically integrate competition standards into course evaluation, and strengthen the standardized training of students’ practical abilities by creating financial vocational application scenarios, so as to implement “course-competition integration” through application scenarios.

4.3. Optimizing learning outcomes

By linking with vocational qualification assessment requirements, improve the knowledge correlation with professional skill level certificates such as banking, securities, fund, and futures practitioner qualifications, “1+X” financial big data processing, personal insurance claims, and family financial planning, increase students’ certificate pass rate, and deepen “course-certificate integration” through learning outcomes.

4.4. Reconstructing teaching content

Jointly develop new-form textbooks with industry experts, vocational skill competition experts, and 1+X certificate assessors to consolidate the achievements of “post-course-competition-certificate” integration by reconstructing textbook content. After optimization and reconstruction, “Fundamentals and Applications of Finance” forms a curriculum mapping system of “12 teaching application scenarios + 10 project-based modules + 39 sub-tasks + 64 skill points.”

5. Empowering teaching with digital technology, “Six-Step Interaction” to reshape positive classroom ecology

5.1. Creating a “Six-Step Interaction” teaching mode

The BOPPPS teaching mode is goal and task-oriented, student-centered, and emphasizes participatory learning and teaching feedback. “Six-Step Interaction” refers to integrating the BOPPPS concept into the pre-class, in-class, and post-class stages, creating six links: clarifying tasks, analyzing tasks, exploring principles, practical exercises, evaluating and summarizing, and expanding tasks, strengthening teacher-student interaction and feedback to stimulate classroom vitality, and helping students return to the center of the classroom.

5.1.1. Pre-class stage

Clarifying tasks: Teachers release learning tasks and discussion themes through the course platform, guide students to carry out PBL group research, and identify teaching key and difficult points based on learning situation data analysis. Students complete preview and pre-class tests through digital resources, and complete group research under the guidance of teachers to form theme reports.

5.1.2. In-class stage

Analyzing tasks: Based on learning situation data, teachers promote task analysis, clarify teaching goals, and create situations with digital resources to introduce teaching tasks, arousing students’ interest.

Exploring principles: Teachers help students master theoretical knowledge through explanation and demonstration, case analysis, etc., integrate ideological and political elements into the process of exploring principles, and organize students to discuss and interact around hot issues in the financial field.

Practical exercises: Teachers organize students to display PBL group activity results in the form of theme reports, carry out interactive Q&A, inspire students to apply principles flexibly, and break through teaching key and difficult points under task driving.

Evaluating and summarizing: Teachers adopt multiple evaluation methods, such as “group mutual evaluation + teacher comments + platform assessment” to evaluate learning effects, timely feedback task completion, and improve teaching implementation effects.

5.1.3. Post-class stage

Expanding tasks: Teachers release after-class assignments and extended resources relying on the course platform, carry out after-class interactive Q&A with the help of visual student digital profiles, implement layered teaching and personalized guidance, and consolidate learning outcomes.

5.2. Building a closed-loop smart classroom of “Pre-Class Intelligent Diagnosis—In-Class Interactive Teaching—Post-Class Digital Profiling”

5.2.1. Pre-class stage

Carry out intelligent diagnosis and dynamic lesson preparation to achieve precise teaching intervention. Teachers release preview tasks and resource pushes through the learning platform, carry out pre-class tests and learning situation analysis, build students’ ability radar charts, timely adjust teaching goals, curriculum key and difficult points, task difficulty gradient distribution, and implement layered teaching. Use the Smart Board Treasure Box to complete lesson preparation tasks such as beautifying teaching courseware and proofreading, and revising teaching plans.

5.2.2. In-class stage

Empower teaching interaction and learning situation feedback during class to improve implementation effects. Give full play to the fulcrum role of new-form textbooks, use digital resources to create situational teaching, and intersperse teaching activities such as real-time interactive evaluation, quick answers, and voting in the teaching implementation process to mobilize students’ participation enthusiasm and stimulate classroom vitality. Teachers pay real-time attention to interactive feedback data, grasp the teaching progress and knowledge point mastery dynamics, and improve teaching implementation effects.

5.2.3. Post-class stage

Build student digital profiles and evaluation feedback after class to timely consolidate learning outcomes. Release assignments, push resources, complete online assignment marking and comments, and give targeted guidance and feedback. Collect multi-dimensional student learning behavior data such as video viewing duration, test accuracy, discussion participation, classroom interaction frequency, and assignment marking, build student digital profiles, and provide personalized guidance. Use open-source AI resources such as DeepSeek, Kimi, and Doubao to build AI teaching assistant robots to achieve full-process companionship and all-around real-time Q&A.

6. Conclusion

This paper addresses the current pain points in specialized basic courses of higher vocational colleges, takes the course “Fundamentals and Applications of Finance” as an example, explores teaching reform, and proposes a “Five-in-One Integration, Three-Dimensional Drive, Six-Step Interaction” implementation path for “Classroom Revolution”, providing a reference for higher vocational colleges to deepen the “Classroom Revolution” in specialized basic courses. By building a “Five-in-One” ideological and political system, it solves the problem of rigid integration of curriculum ideological and political education, and innovates a finance-characteristic curriculum ideological and political teaching mode. Taking the development of new-form textbooks as the starting point, it reconstructs teaching content from three dimensions of task driving, scenario driving, and outcome driving to promote the in-depth integration of “post-course-competition-certificate.” By integrating the BOPPPS concept into the pre-class, in-class, and post-class stages, creating a six-step interactive classroom process of “Clarify, Analyze, Explore, Practice, Evaluate, and Expand”, and building a closed-loop smart classroom of “pre-class intelligent diagnosis—in-class interactive teaching—post-class digital profiling”, it strengthens teaching interaction and feedback to stimulate vitality, helps students return to the center of the classroom, and reshapes a positive classroom ecology.

Funding

2023 Shenzhen Educational Science “14th Five-Year Plan” Project “Effect Evaluation and Promotion Strategy Research on the Construction of Vocational Undergraduate Industry Colleges” (yb23032);

Research on Teaching Practice of Western Economics under the Background of Vocational Undergraduate Education (2023JG430);

Research on Teaching Practice of Western Economics under the Background of Vocational Undergraduate Education (7022310141);

Theoretical Mechanism and Empirical Research on R&D Tax Incentives to Optimize Export Structure (GD24YLJ01);

Uncertainty Risk Perception and Innovation Behavior of Heterogeneous Executive Teams: Influence Mechanisms and Governance Mechanisms (23YJCZH032);

The Impact Mechanism of Enterprise Uncertainty Risk Perception on Innovation Decision-Making Behavior: A Text Analysis Method Based on Listed Companies’ Annual Reports (GD23XLJ05);

Research on the Coordination Mechanism and Optimization Path of Higher Vocational Education in Guangdong Province Empowering Regional New Quality Productivity Development (2024GXJK771)

Disclosure statement

The authors declare no conflict of interest.

References

- [1] Zhang LY, Yu ZH, 2022, Research on the Essentials, Elements and Paths of Classroom Revolution in Higher Vocational Education. *Education and Vocation*, 2022(6): 104–108.
- [2] Jia LP, Guo J, 2022, Discussion on “Classroom Revolution” in Higher Vocational Colleges. *Higher Education*

Forum, 2022(1): 97–100.

- [3] Xiao X, Yao LM, Jiao KJ, 2023, Research and Practice on the Construction Path of Ideological and Political Demonstration Courses for Financial Courses—Taking the Course “Money and Banking” as an Example. *Journal of Jiujiang Vocational and Technical College*, 2023(4): 32–36.
- [4] Zhang HH, 2025, Research on the Optimization Path of Ideological and Political Education in Financial Market Courses under the Guidance of New Liberal Arts. *Youth Times*, 2025(14): 44–46.
- [5] Zheng Y, Sun ZJ, 2024, Research on the Digital Transformation Path of Finance Discipline in Universities under the Background of Digital Economy. *Foreign Economic Relations & Trade*, 2024(9): 111–114.
- [6] Wang HM, 2023, Discussion on the Digital Transformation Path of Finance Course Teaching under the Background of New Liberal Arts. *Modern Business Trade Industry*, 44(15): 239–240.
- [7] Shi J, 2025, Practice and Reflection on the Evaluation of Teaching Value-Added Effectiveness in Ideological and Political Education of Finance Course Driven by Digital Intelligence. *PR World*, 2025(12): 139–141.
- [8] Wei DM, Lin XY, 2025, Research on the Construction of a Quality Evaluation System for Ideological and Political Education in Finance Major Courses Based on the CIPP Model. *Data of Culture and Education*, 2025(6): 69–72.
- [9] Wang XL, Wang ZH, 2025, Research on Teaching Reform to Cultivate College Students’ Green Financial Literacy in the Context of Curriculum Ideology and Politics: A Case Study of Finance Course. *Chinese Economist*, 2025(3): 149–150 + 152.
- [10] Li XW, Huang HL, 2025, Research on the Integration of “Post, Course, Competition, and Certificate” to Promote the Classroom Revolution in Tax Accounting. *Chinese Economist*, 2025(5): 215–216.
- [11] Chen JL, Bo XD, Wang K, 2025, Research and Practice of “Integrated Classroom” for New Business Professional Groups Based on “Post-Course-Competition-Certificate+”. *Modern Business Trade Industry*, 2025(2): 242–244.
- [12] Wang YP, 2024, Research on the Reform and Practice of the Smart Classroom Teaching Model in Finance Major. *Marketing Circle*, 2024(8): 128–130.
- [13] Wang XL, Kong SQ, 2020, Design and Application of Smart Classroom in Finance under the BOPPPS Teaching Model. *Heilongjiang Education (Theory and Practice)*, 2020(3): 67–68.
- [14] Liang L, He Y, 2025, Research on Teaching Reform of Traditional Finance Courses Driven by Financial Technology. *Journal of Jining Normal University*, 47(3): 57–62.
- [15] Xu RJ, 2025, Reform and Practice of International Finance Course in Private Universities Based on Online and Offline Blended Teaching Mode. *Zhongguancun*, 2025(4): 225–227.

Publisher’s note

Bio-Byword Scientific Publishing remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Research on the Challenges and Pathways of AI-Driven Digital Transformation in University Aesthetic Education

Nannan Cao*, Qin Tong

Chongqing University of Posts and Telecommunications, Chongqing 400000, China

**Author to whom correspondence should be addressed.*

Copyright: © 2025 Author(s). This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0), permitting distribution and reproduction in any medium, provided the original work is cited.

Abstract: While artificial intelligence (AI) presents new opportunities for the digital transformation of aesthetic education in higher education, it also introduces significant challenges. These include an imbalance between instrumental and value rationality, a mismatch between technological capabilities and the needs of aesthetic education, inefficient resource development and sharing, outdated teaching models, and insufficient digital literacy, as well as gaps in evaluation systems. To address these issues, this study proposes a strategic framework for transformation: guiding technology use with the principle of “aesthetic cultivation”, developing a supportive and adaptive technological infrastructure, fostering a high-quality, shared digital resource ecosystem, redesigning human-AI collaborative teaching models, and establishing a multidimensional evaluation system that integrates technical and artistic criteria. These recommendations aim to facilitate the digital evolution of aesthetic education in the AI era, ultimately nurturing a new generation with refined aesthetic sensibilities and creative capabilities.

Keywords: AI; University aesthetic education; Digital transformation; Challenges and pathways

Online publication: September 18, 2025

1. Introduction

Aesthetic education plays a pivotal role in higher education by cultivating students’ aesthetic appreciation and humanistic literacy. With the implementation of relevant policies, university aesthetic education has entered a period of unprecedented development. Concurrently, artificial intelligence (AI) is profoundly reshaping the educational landscape. Generative AI, VR/AR, and other emerging technologies provide robust support for content creation, scenario simulation, interactive experiences, and personalized learning in aesthetic education.

The integration of aesthetic education and AI represents both an inevitable trend in technological empowerment and a crucial solution to longstanding challenges such as uneven resource distribution, rigid teaching models, and simplistic evaluation methods. However, this integration faces inherent tensions between

technological rationality and artistic sensibility, between efficiency-driven approaches and the fundamental purpose of education, and between instrumental applications and value-oriented guidance.

Given these challenges, a thorough analysis of transformation obstacles and the exploration of strategic pathways are essential for achieving high-quality digital aesthetic education. This study aims to address these critical issues and propose actionable solutions.

2. Challenges in AI-driven digital transformation of aesthetic education in higher education

2.1. Imbalance between instrumental and value rationality

Max Weber distinguished between value rationality (focusing on the intrinsic worth of actions) and instrumental rationality (emphasizing means to achieve ends) ^[1]. In university aesthetic education, these should complement each other — value rationality establishes the direction of “cultivating people through beauty”, and instrumental rationality provides technical support. However, the digital transformation process has witnessed an imbalance where instrumental rationality expands while value rationality diminishes.

Under instrumental rationality dominance, aesthetic education faces the predicament of “means replacing ends.” Excessive emphasis on quantifiable metrics like AI adoption rates, digital resource quantities, and platform engagement reduces aesthetic evaluation to algorithmically measurable parameters (color schemes, compositions, etc.), while neglecting whether these technologies genuinely cultivate students’ aesthetic literacy. This approach severs essential value dimensions like emotional resonance and cultural understanding, gradually diverting aesthetic education from its core purpose and reducing it to a mere technological appendage.

The weakening of value rationality exacerbates the loss of fundamental educational values. The ultimate goal of “aesthetic cultivation”, cultivating people through beauty, aims to holistically develop students’ aesthetic sensibility, nurture character, enrich spiritual life, and stimulate creative vitality — all value-rational objectives that resist quantitative measurement ^[2–3]. When technological applications dominate teaching, the humanistic essence of aesthetic education becomes marginalized: emotional experiences yield to virtual interaction convenience, and personalized creation gives way to standardized templates. This rational imbalance constitutes the profound theoretical foundation of value cognition dilemmas in the digital transformation of university aesthetic education.

2.2. Structural mismatch between AI technical characteristics and aesthetic education needs

The application of artificial intelligence technology in university aesthetic education teaching faces significant structural compatibility challenges, stemming from inherent tensions between AI’s technical characteristics and the fundamental requirements of aesthetic education. At its core, aesthetic education aims to enhance human aesthetic experience and perception, pursuing spiritual connections, emotional resonance, and meaningful engagement ^[4]. In contrast, AI technology operates on principles of standardized data processing, algorithmic logic, and quantifiable outputs — creating a fundamental divergence in operational mechanisms.

Most current AI tools are developed for general purposes without deep customization for aesthetic education pedagogy, leading to a disconnect between technical application and teaching needs. For example, AI painting tools can quickly generate images but often fail to accurately capture the emotional expression and cultural connotations in student creations; intelligent evaluation systems can analyze the formal elements

of works but cannot fully interpret their humanistic value. This “mismatch” greatly diminishes the potential benefits of AI integration.

Furthermore, a contradiction exists between the rapid evolution of AI technology and the stability requirements of higher education systems. While AI algorithms and tools undergo constant innovation, university curricula and teaching plans require rigorous evaluation and pilot testing before implementation — creating an inherent pace discrepancy in adoption.

Moreover, inadequate hardware and software infrastructure remain a significant challenge in technology adoption. Due to budget constraints and limited equipment, many universities lack the necessary smart devices, computing resources, and network capabilities to fully support digital art education. As a result, technological integration remains superficial, failing to meaningfully enhance core teaching and learning processes

2.3. Dual obstacles of extensive resource construction and the sharing mechanism

The quality problem of digital aesthetic education resources is a prominent shortcoming in the transformation process. At present, there is a tendency towards a quantity-over-quality approach in digital resource creation. A large number of resources lack systematic issues, including fragmented content and excessive homogenization. Many resources merely digitize traditional materials without AI-enhanced innovation, and cannot fully convey the emphasis on emotion, experience, and perception in aesthetics ^[5]. At the same time, overemphasis on technical presentation may lead to the weakening of the educational function of resources, including emotional, experiential, and perceptual dimensions of aesthetics.

The imperfect resource-sharing mechanism restricts the exertion of resource efficiency. Barriers exist in sharing digital art education resources between universities and between academic institutions and social organizations, compounded by the lack of uniform standards and a centralized sharing platform. While AI technology offers the potential to facilitate resource exchange, the absence of supporting institutional frameworks and benefit-sharing mechanisms prevents high-quality resources from being equitably distributed across regions and institutions.

2.4. Synergistic shortcomings of teaching model inertia and digital literacy

The path dependence of traditional aesthetic education teaching models forms a strong resistance to digital transformation. For a long time, traditional aesthetic education teaching has been teacher-centered, with students passively accepting knowledge, making it difficult to stimulate their aesthetic subjectivity ^[6]. Some teachers have insufficient understanding of digital transformation, lack the awareness of active reform, and are still accustomed to traditional teaching processes, resulting in AI technology being difficult to integrate into the entire teaching process.

The insufficient digital literacy of teachers is also a key bottleneck restricting transformation. Currently, most art education instructors in higher education lack adequate digital competencies, with systemic training programs remaining underdeveloped. Some teachers have a fear of AI technology and find it difficult to effectively apply it to teaching design, resource development, and teaching evaluation. At the same time, excessively relying on AI tools for teaching decision-making may lead to an imbalance in pedagogical priorities, where technical efficiency overshadows the essential humanistic dimensions of art education. These also result in the “dehumanization” of the teaching process and deviating from the educational essence of aesthetic education.

Differences in students' digital learning abilities also exacerbate teaching challenges. There are significant differences in students' acceptance and mastery of AI tools. Some students can quickly adapt to the digital teaching environment, while others, especially those with weak technical foundations, may affect their learning effects due to unfamiliarity with tool operations and even generate learning anxiety. This difference may lead to a "digital divide" in aesthetic education teaching, affecting educational equity.

2.5. Gap between technical quantification and aesthetic experience in teaching evaluation

The conventional evaluation framework for aesthetic education struggles to meet the demands of digital transformation. Current systems predominantly rely on quantitative metrics, such as scores and grades, which fail to adequately assess the humanistic dimensions central to aesthetic learning in an AI-enhanced environment. Key qualities like depth of aesthetic experience, emotional resonance, creativity, and critical thinking remain underrepresented in these assessments.

While AI technologies offer new possibilities for evaluation—such as automated analysis of visual compositions through image recognition and data processing—their current applications are limited. Most AI-driven tools focus on formal attributes of artwork (e.g., technique, color, or composition) but cannot effectively evaluate subjective dimensions such as emotional depth, cultural significance, or innovative intent. This technological constraint hinders the potential for more nuanced, holistic assessment in aesthetic education.

Furthermore, the application of AI technology to evaluate complex artistic processes, such as improvisation, collaborative creation, and critical appreciation, lacks established standards and reliable assessment tools. Moreover, the transparency and interpretability of AI evaluation models are insufficient, which may imply cultural and style biases brought by training data, and the fairness and educational nature of evaluation results are easily questioned.

3. Pathway reconstruction for AI-driven digital transformation in university aesthetic education

3.1. Cultivating people through beauty, reconstructing the logic of aesthetic education value, and leading technology

The key to solving the imbalance between instrumental and value rationality lies in reconstructing the logical relationship of "value leading technology" to realize their complementary coexistence.

First, establish a correct concept of artificial intelligence use, clarify the core position of the ultimate goal of "cultivating people through beauty" in digital transformation, and take the improvement of students' aesthetic literacy as the fundamental evaluation standard for transformation. In the links of teaching goal design, technical application planning, and resource development, priority is given to whether it serves the deepening of aesthetic experience and the cultivation of humanistic spirit, rather than simply pursuing technical coverage or efficiency indicators.

Second, standardize the application boundary of instrumental rationality and establish a "technical adaptability evaluation mechanism" to screen the application scenarios of AI technology in aesthetic education teaching to avoid technical abuse. For example, in aesthetic evaluation, algorithms can assist in analyzing the formal characteristics of works (color, composition, etc.), but must combine teachers' subjective interpretation of emotional connotation and cultural value. At the same time, build a "value-tool" collaborative evaluation system, break through the limitations of a single quantitative indicator, and design a multi-dimensional

evaluation framework covering “technical efficiency” and “educational value.” Pay attention to both the instrumental rationality dimensions, such as the application efficiency of AI tools and the accessibility of resources, and more importantly, the value rationality dimensions, such as the depth of students’ aesthetic perception, the independence of aesthetic judgment, and the improvement of humanistic literacy, to avoid the transformation falling into the misunderstanding of “technology-only theory.”

3.2. Demand-oriented development of a techno-pedagogical support system for aesthetic education

Promoting the deep integration of technology and aesthetic education based on demand is the core path to breaking through the adaptability dilemma. Universities should collaborate with technology developers to create specialized AI tools and platforms that precisely align technical capabilities with the emotional and creative requirements of aesthetic pedagogy, particularly focusing on intelligent systems that support personalized learning, immersive experiences, and creative expression, such as emotion-aware interactive teaching platforms and culturally-sensitive creative assistance tools.

Strengthening the technical support system is essential for ensuring a successful transformation. Universities should increase investment in digital infrastructure for aesthetic education, including smart devices, high-speed networks, and computing centers. Crucially, they must establish coordination mechanisms between technological upgrades and teaching adjustments to balance innovation with system stability.

Collaboration with industry partners is essential to deploy dedicated technical support teams. These teams can test new algorithms and tools in real teaching environments, identify the most compatible solutions, and provide ongoing training and guidance to faculty, reducing the burden of technology adoption.

3.3. Building a high-quality shared digital resources ecosystem for aesthetic education

Establishing a standard system for high-quality digital resources is the prerequisite for improving resource quality. Universities should cooperate with aesthetic education experts and educational technology experts to formulate construction standards for digital aesthetic education resources. In terms of technical dimension, combined with AI interactivity and immersive characteristics, develop innovative forms such as virtual art exhibition halls and interactive creative tools; in terms of humanistic dimension, strengthen the cultural connotation and educational value of resources, ensure that the content covers aesthetic thoughts, art history context and cultural spirit, and avoid the disconnection between technical presentation and humanistic core.

A robust quality assurance system requires the formation of interdisciplinary review panels consisting of aesthetic education experts, technical specialists, and practicing educators. These panels should conduct thorough evaluations based on three key criteria: educational effectiveness, artistic merit, and technical implementation.

To optimize resource utilization, a three-tier sharing platform (national-regional-institutional) should be established with standardized formats, metadata protocols, and access specifications to facilitate cross-institutional collaboration. Sustainable participation can be encouraged through equitable incentive mechanisms, including intellectual property protection and revenue-sharing models, thereby motivating universities, museums, and galleries to contribute high-quality resources.

Blockchain technology offers an effective solution for digital rights management, particularly in establishing clear attribution for both traditional and AI-generated content. This technological approach

addresses copyright challenges while simultaneously stimulating ongoing innovation in resource development. Together, these measures create an integrated framework that balances technological advancement with educational integrity in digital aesthetic education.

3.4. People-oriented, reshaping the human-machine collaborative teaching model for aesthetic education

The rapid development of artificial intelligence has promoted significant changes in the talent training model in the field of higher education, transforming the teaching model from a “teacher-student” binary structure to a “teacher-machine-student” ternary structure^[7]. In this context, college teachers should integrate AI technology into the entire process of teaching design and build a new “human-machine collaborative, student-centered” teaching model. In theoretical teaching, use VR/AR technology to create immersive art scenes, combine with AI voice interaction to achieve in-depth interaction with virtual art scenes, and enhance students’ aesthetic experience; in practical teaching, carry out “technology-assisted creation” teaching with the help of AI creative tools, guide students to regard AI as a tool for realizing creativity rather than a substitute, such as using AI to generate first drafts and then deepen emotional and cultural expression through independent modification and secondary creation, cultivating the composite ability of “technical application + humanistic thinking.”

In this process, improving the digital literacy of teachers and students is crucial. Colleges should incorporate digital literacy into the core competency requirements of aesthetic education teachers, formulate systematic training plans covering AI technology foundation, teaching application strategies, data analysis methods, and ethical norms.

At the same time, pay attention to the differentiated cultivation of students’ digital learning abilities. Offer general courses on “AI and Aesthetic Education” to help students master basic AI tool usage methods and digital learning strategies, and improve their adaptability to technical applications. Establish learning support systems, provide one-on-one tutoring and resource push for students with weak technical foundations, and alleviate learning anxiety through peer mutual assistance and online Q&A to ensure that all students participate in the digital teaching process equally.

3.5. Constructing a multidimensional teaching evaluation paradigm integrating skills and artistry for aesthetic education

The reform of teaching evaluation in the intelligent era needs to pay attention to both the accuracy and efficiency of technology and the aesthetic and humanistic nature of art^[8]. Building a “technology + art” diversified evaluation system is the core to breaking through the evaluation dilemma. Colleges should break the limitations of traditional evaluation systems, establish multi-dimensional evaluation indicators covering knowledge mastery, skill application, emotional experience, cultural perception, and innovation ability, and incorporate value rational dimensions into core indicators.

In terms of evaluation subjects, form a human-machine collaborative evaluation model of “AI tools, teachers, students, social experts.” AI tools are responsible for the objective analysis of formal elements of works and learning behavior data, teachers focus on the subjective evaluation of emotional connotation and cultural value, students develop reflective ability through self-evaluation and mutual evaluation, and social experts participate in the evaluation of the innovation and social value of works, ensuring the comprehensiveness and objectivity of evaluation and realizing the complementarity of “machine objective

empowerment” and “humanistic guidance.” It should be emphasized that technical teams should be united to develop AI evaluation tools integrating humanistic semantic understanding to avoid the mechanization of evaluation, clarify the application boundary of AI evaluation, and position it as an “auxiliary tool” rather than a “decision-maker.”

Strengthen the feedback and application of evaluation results. Use AI technology to build a visual analysis platform for evaluation results, provide teachers with accurate suggestions for teaching improvement, generate personalized learning diagnosis reports for students, clarify advantages and disadvantages, and guide self-improvement.

4. Conclusion

The digital transformation of college aesthetic education needs to balance technical tools and humanistic values, and realize the return from technical application to the essence of education through systematic reconstruction. The key lies in establishing a value-led technical application logic, developing highly adaptable intelligent tools, building a resource-sharing ecosystem, innovating teaching models and improving evaluation systems, and finally achieving the organic unity of “technical empowerment” and “cultivating people through beauty.”

Funding

Phased achievements of “2020 General Project of Humanities and Social Sciences Research of Chongqing Municipal Education Commission (Project No.: 20SKGH066)” and “2023 School-Level Educational Teaching Reform Project of Chongqing University of Posts and Telecommunications (Project No.: XJG23264)”.

Disclosure statement

The authors declare no conflict of interest.

References

- [1] Wang C, Zheng C, 2014, Value Rationality and Instrumental Rationality and Their Methodological Significance — Based on Max Weber’s Dichotomy of Rationality. *Journal of University of Jinan (Social Science Edition)*, 24(2): 48–53.
- [2] Xu Z, Chen Y, 2024, Connotation, Value Implication and Practical Approach of Curriculum Aesthetic Education in the New Era. *Social Science Front*, 2024(12): 273–280.
- [3] Ministry of Education, 2023, Notice on the Comprehensive Implementation of the School Aesthetic Education Infiltration Action. http://www.moe.gov.cn/srcsite/A17/moe_794/moe_628/202401/t20240102_1097467.html
- [4] Mao Y, Li Y, 2023, The Reform of Aesthetic Education in the Digital Media Era: Difficulties and Transcendence. *Journal of Qilu Normal University*, 38(5): 29–36.
- [5] Dong X, Zhang Y, 2023, Construction of College Aesthetic Education Curriculum Ecology from the Digital Perspective: Elements, Obstacles and Countermeasures. *Chinese Art Research*, 2023(3): 218–223.
- [6] Yin X, 2025, Research on Digital Transformation Empowering High-Quality Development of Aesthetic Education. *Dahe Art Newspaper*, June 6, 2025, 8.

- [7] Yang Z, 2024, Digital Development of Higher Education: New Characteristics, New Paradigms and New Paths. China Higher Education, 2024(Z1): 24–28.
- [8] Guo W, 2025, From Technical Discipline to Artistic Sublimation: Reflection on Teaching Aesthetics in the Intelligent Era. Curriculum, Teaching Material and Method, 45(6): 54–62.

Publisher's note

Bio-Byword Scientific Publishing remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.



Integrated Services Platform of International Scientific Cooperation

Innoscience Research (Malaysia), which is global market oriented, was founded in 2016. Innoscience Research focuses on services based on scientific research. By cooperating with universities and scientific institutes all over the world, it performs medical researches to benefit human beings and promotes the interdisciplinary and international exchanges among researchers.

Innoscience Research covers biology, chemistry, physics and many other disciplines. It mainly focuses on the improvement of human health. It aims to promote the cooperation, exploration and exchange among researchers from different countries. By establishing platforms, Innoscience integrates the demands from different fields to realize the combination of clinical research and basic research and to accelerate and deepen the international scientific cooperation.

Cooperation Mode



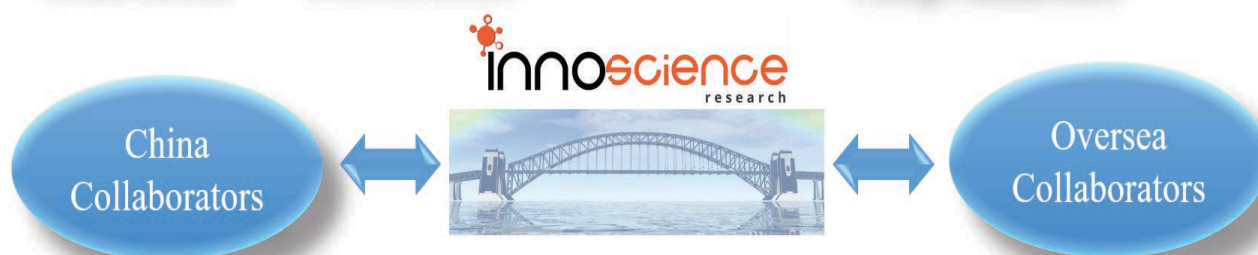
Clinical Workers



In-service Doctors



Foreign Researchers



Hospital



University



Scientific institutions

OUR JOURNALS



The *Journal of Architectural Research and Development* is an international peer-reviewed and open access journal which is devoted to establish a bridge between theory and practice in the fields of architectural and design research, urban planning and built environment research.

Topics covered but not limited to:

- Architectural design
- Architectural technology, including new technologies and energy saving technologies
- Architectural practice
- Urban planning
- Impacts of architecture on environment

Journal of Clinical and Nursing Research (JCNR) is an international, peer reviewed and open access journal that seeks to promote the development and exchange of knowledge which is directly relevant to all clinical and nursing research and practice. Articles which explore the meaning, prevention, treatment, outcome and impact of a high standard clinical and nursing practice and discipline are encouraged to be submitted as original article, review, case report, short communication and letters.

Topics covered by not limited to:

- Development of clinical and nursing research, evaluation, evidence-based practice and scientific enquiry
- Patients and family experiences of health care
- Clinical and nursing research to enhance patient safety and reduce harm to patients
- Ethics
- Clinical and Nursing history
- Medicine



Journal of Electronic Research and Application is an international, peer-reviewed and open access journal which publishes original articles, reviews, short communications, case studies and letters in the field of electronic research and application.

Topics covered but not limited to:

- Automation
- Circuit Analysis and Application
- Electric and Electronic Measurement Systems
- Electrical Engineering
- Electronic Materials
- Electronics and Communications Engineering
- Power Systems and Power Electronics
- Signal Processing
- Telecommunications Engineering
- Wireless and Mobile Communication

