Education Reform and Development, 2025, Volume 7, Issue 1
https://ojs.bbwpublisher.com/index.php/ERD
Online ISSN: 2652-5372
Print ISSN: 2652-5364

Digital Intelligence Technology Creates a New Paradigm of Blended Teaching in College Physics Courses

Tianfang Yang*

Karamay Campus, China University of Petroleum (Beijing), Karamay 834000, Xinjiang, China

***Corresponding author:** Tianfang Yang, tfyang@cupk.edu.cn

Abstract: With the continuous development of science and technology, the integration of information teaching means and curriculum teaching is further deepened. The application of intelligent means to create efficient classrooms has become the choice of many teachers. In this context, college physics teachers rely on digital intelligence technology to build an online and offline integration of teaching platforms, develop and design unique interactive teaching modes and teaching resources, guide students to deeply understand physics concepts and problem-solving ideas in a good situation, and encourage students to gradually have a good independent learning ability and innovation awareness while deep learning. This paper studies the mixed teaching of college physics courses under the number intelligence technology and puts forward the corresponding views.

Keywords: Numerical intelligence technology; College physics course; Blended teaching; Research

Online publication: February 10, 2025

1. The overall design idea of mixed teaching mode

"College Physics" is a public basic course for students of lower grades who are not physics majors [1]. In the context of quality education, the view of "student-centered" education has gradually become mainstream [2]. Many educationalists and experts agree that the goal of education should be to cultivate talents who can adapt to social changes, have independent personalities, are fully developed, and know how to learn. Based on this educational philosophy, all activities in the teaching process should be centered around this goal. In the mixed teaching mode of college physics supported by digital and intelligent technology, the design of the teaching program should follow the principle of guiding students from "answering questions and solving problems" to "discovering problems and raising problems."

According to the basic law of scientific talent view, the teaching design of college physics can be divided into three goals: knowledge mastery, ability cultivation and ideological and political education [3]. For example, in the actual teaching process, teachers can make full use of MOOC (Massive Open Online Course) resources and

expand the entire teaching process into a problem-driven interactive teaching model of three stages, including pre-class (online learning), mid-class (offline large class) and after-class (offline small class discussion), centered on offline large class. This mode can not only help students better grasp knowledge, but also effectively improve their practical ability and innovative thinking. At the same time, it can also play an important role in ideological and political education, to comprehensively improve the comprehensive quality of students.

2. The importance of building a mixed teaching pattern of college physics courses with the help of numerical intelligence technology

2.1. Docking with the development of the era

The 10-year Development Plan for Information in Education puts forward a core point of view, that is, one of the important development directions of higher education reform is to carry out effective teaching activities around information and multimedia technology [4]. This point of view emphasizes the importance of educational technology in modern education, pointing out that the use of these technical means can greatly enrich the content and form of teaching and improve the teaching effect. College physics teachers have begun to adopt a hybrid teaching method, combining online and offline teaching, and applying digital intelligence technology to build a new education platform. This teaching method not only enhances students' learning experience and makes them feel more engaged and interesting during the learning process, but also ensures that students acquire knowledge and skills while constantly building and consolidating correct values and worldviews. In this way, students are able to keep progressing in the trend of the era in education and become high-quality talents who adapt to the needs of social development.

2.2. Further deepen the reform of college physics teaching

In the traditional teaching mode of college physics, teachers usually focus on explaining the theoretical concepts, problem-solving skills and methods of physics according to the teaching syllabus and talent training programs [5]. At the same time, teachers will also encourage students to participate in various forms of practical activities to enhance the understanding and application of physics knowledge. However, this traditional teaching method has certain limitations. It is often difficult for students to grasp the knowledge deeply and form a systematic theoretical framework. In addition, this kind of teaching mode is not conducive to the cultivation and development of students' innovative abilities and thinking consciousness.

Under the background of the rapid development of the Internet and big data technology, college physics teachers can build a mixed teaching system and teaching platform with the help of digital and intelligent technology. This new teaching mode can effectively break through the limitations of traditional teaching methods and provide students with a more flexible and diversified learning experience. Through the flipped classroom teaching method, students can independently learn theoretical knowledge through the network platform before class, and participate more in interactive links such as discussion, experiment and problem-solving in class [6]. This teaching mode not only stimulates students' interest in learning but also cultivates their ability to independent learning, critical thinking, and innovation. In addition, the blended teaching system is also able to provide students with rich learning resources and personalized learning paths, enabling them to pursue in-depth learning according to their interests and needs. In this way, students will not only have a better grasp of physics knowledge but also be able to comprehensively improve their overall quality and multiple abilities. Therefore, this new teaching model is expected to effectively deepen the reform of curriculum teaching and

provide strong support for cultivating high-quality talents with innovative spirit and practical ability.

3. The strategy of applying digital intelligence technology to build a blended teaching platform for college physics courses

3.1. Improve the teaching staff and do a good job in the early stage

To fully tap and play the great potential of digital intelligence technology in the field of education, and further promote the deep integration of blended teaching mode and college physics courses, the school should not only strive to build a fully functional, efficient and intelligent education platform, but also pay special attention to the cultivation and improvement of the educational ability of teachers [7]. Specifically, the school can organize various forms of training and seminars to help teachers understand and master the latest digital intelligence technologies, such as artificial intelligence, big data analysis, cloud computing and so on [8]. In addition, schools can invite experts with rich experience in the application of digital intelligence technology to give lectures and guidance, providing teachers with more learning opportunities and practical experience. Through these measures, teachers can not only improve their ability to apply educational technology, but also better stimulate students' interest in learning during the teaching process, and improve the pertinence of curriculum teaching through this way. At the same time, schools should also pay attention to the cultivation of teachers' information literacy, encourage teachers to actively use information teaching tools and resources, and improve the richness and interactivity of teaching content. In this way, teachers can better adapt to the digital education environment and provide students with a more personalized and efficient learning experience. In addition, schools also need to collect teachers' feedback regularly, guide teachers to participate in teaching and research activities according to recent teaching problems, avoid deviations in subsequent teaching activities, and give full play to the application value of mixed teaching methods.

3.2. Self-study before class to cultivate multiple abilities

In the mixed teaching mode, online teaching is very important, which is related to the effectiveness of subsequent teaching activities. In order to ensure the quality of online teaching and meet the needs of students' comprehensive development, physics teachers need to analyze students' comprehensive ability and teaching content before teaching, and then guide students to complete the task of pre-class preview using "design-upload-share-summary" [9]. In general, the online teaching platform set up by colleges and universities covers several sections, such as teacher-student interaction, teacher-student resource library, virtual simulation, etc. Teachers can carry out online teaching activities on this platform, and students can interact with teachers and consult learning materials in a timely manner.

Pre-class learning tasks mainly include MOOC video learning content (the learning order is mainly based on the MOOC resources of the university, but students are also encouraged to make use of high-quality resources from other universities at home and abroad), textbook reading content, and the release of concept self-tests that students are required to complete and submit online before class [10]. Self-tests are usually designed in the form of essay questions based on the sequence in which the content is developed. The answer to each question can be clearly explained in the textbook or video study. For example, in the concept self-test for the lesson "Induced Electromotive Force and Induced Electric Field," you can design the following questions:

(1) How is the induced electromotive force defined?

(2) How is Maxwell's hypothesis of induced electric field described?

(3) Compare Faraday's law of electromagnetic induction with the mathematical expression of the definition of the induced electromotive force, and try to explain the non-electrostatic field that produces the induced electromotive force.

(4) Sort out the basic steps of calculating the "distribution of vortex electric field inside and outside long straight solenoid" in the textbook examples, and list the application and possible harm of vortex current in real life mentioned in videos and textbooks.

Through such pre-class learning task design, students can not only have a preliminary understanding and grasp of the content to be learned but also integrate and analyze the questions raised by students in the online teaching stage, so that the offline teaching can be explained pertinately.

3.3. Offline teaching, accurate guidance and training

Offline teaching is mainly to help students better understand those abstract and difficult knowledge points, and on this basis to cultivate their practical ability and innovative thinking. To achieve this teaching goal, when choosing teaching projects, teachers should not only ensure that these projects meet the requirements of the syllabus but also ensure that they can deepen students' understanding of knowledge and promote the all-round development of students' abilities and literacy in multiple dimensions [11]. The teaching platform provided by the school not only provides strong technical support for teachers to carry out online teaching activities but also provides powerful assistance for teachers to complete offline teaching tasks. Therefore, teachers of physics courses can make full use of these platforms to integrate modern teaching methods such as big data analysis, Internet resources and virtual simulation technology into offline teaching to enrich teaching content and forms.

In the offline teaching stage, teachers can focus on guiding students to deeply explore the similarities and differences between the eddy electric field and the electrostatic field. First of all, teachers can organize students to have a group discussion and ask them to write the circulation of the electrostatic field and vortex electric field and the flux of electric field intensity on a closed surface respectively, and try to draw the electric field line of the electrostatic field, and then guide them to draw the closed electric field line of vortex electric field. Through this process, students can more intuitively understand the characteristics of the two electric fields [12].

Secondly, teachers can encourage students to further explore the specific cases and functions of vortex electric fields in practical applications by consulting relevant materials. This kind of exploration activity can not only fully reflect students' subjectivity, but also help them combine theoretical knowledge with practical problems, and improve their comprehensive analysis ability and problem-solving ability. Finally, to test students' mastery of this knowledge point, teachers can organize a classroom quiz [13]. The content of this random test includes not only the test of theoretical knowledge but also the inspection of the experimental operation ability. Through this evaluation method, teachers can have a more comprehensive understanding of students' learning situation, and adjust subsequent teaching plans and methods accordingly to ensure the maximum teaching effect.

3.4. Multiple teaching evaluation, reflecting the guidance of digital intelligence technology

Based on the mixed teaching mode, physics teachers need to do a good job in teaching evaluation to improve students' overall ability [14]. First of all, in online evaluation, teachers need to make full use of the recording function provided by the online platform. Secondly, teachers also need to pay attention to students' classroom evaluations. Through these evaluations, teachers can not only help students build up their confidence in learning but also help students establish correct development cognition [15]. This kind of cognition has important guiding significance for students' future learning and growth. Finally, teachers also need to pay attention to the evaluation

of students' innovative thinking and experimental ability. After that, teachers need to adjust and improve the teaching content and teaching methods according to the evaluation of students. Such continuous improvement is conducive to further realizing the goal of curriculum teaching reform and making teaching more in line with the needs of students and the development of the era. The new teaching evaluation can reflect the guiding value of digital intelligence technology, but also can improve the learning effect of students, and finally realize the all-round development of students.

4. Conclusion

In recent years, to further promote the development of higher education, China's Ministry of Education issued the "Code for the Construction of Digital Campus in Colleges and Universities (Trial)," pointing out that colleges and universities should attach importance to the construction of digital campus, focus on moral cultivation and combine with the needs of school education, and give full play to the application value of information technology, especially digital intelligence technology, so as to realize the innovation of education methods and the improvement of education system. In the teaching of college physics courses, teachers rely on digital intelligence technology to carry out teaching activities, which can improve the pertinency of teaching and reduce the teaching burden. At the same time, teachers use AI technology, virtual simulation technology, knowledge graph and other technologies to build online and offline teaching systems, which can promote the development of students' diversified abilities and thus promote the reform of physics teaching.

Funding

Karamay Campus, China University of Petroleum (Beijing), "Construction of Ideological and Political Case Base of College Physics Course Based on the Integration of Physics History and Advanced Achievements" (Project No.: JX000044008); "Curriculum Design and Practice Research of University Physics Blended Teaching Based on Rain Classroom Platform" (Project No.: JG2023045); "Molecular Dynamics Mechanism of Pyrolytic Reaction in Heavy Oil Fire Flooding Development" (Project No.: 20220045)

Disclosure statement

The author declares no conflict of interest.

References

[1] Lu H, Liu Y, 2024, Research on Blended Teaching Practice of College Physics Based on OBE Trinity. Journal of Guizhou Institute of Engineering and Applied Technology, 42(3): 112–117.

[2] Li N, Yan Q, Fang J, et al., 2019, Research on Blended Teaching Reform of College Physics Based on Curriculum Ideological and Political Integration. Guangxi Physics, 45(2): 157–160.

[3] Liu J, Wu H, Ma Y, et al., 2024, Application of PTCL Mixed Teaching Model in College Physics. Guangxi Physics, 45(3): 64–66.

[4] Zhao C, 2023, Research on Promoting Online and Offline Physics Teaching Reform Through Curriculum Ideological and Political Construction. Proceedings of the First "Teaching and Learning Summit Forum in the

Context of New Curriculum Reform" (2), School of Physics, Guizhou University; China Education Innovation (Beijing) Culture Media Co., LTD., China Global Culture Press, 3.

[5] Yao Z, 2023, Research on the Reform of Mixed Teaching Mode of College Physics Curriculum. Proceedings of the First Life Education Academic Forum in 2023, Wuchang Institute of Technology; China Tao Xingzhi Research Association, 3.

[6] Xu L, Qin X, 2023, Optical Talent Training Based on Mixed Teaching Model in Local Characteristic Universities Under the Background of New Engineering. Physics Bulletin, 2023(4): 21–23.

[7] Xiong L, Wang W, Yang W, et al., 2023, Relying on the Construction of First-Class Curriculum – A Probe into the "Learning-Centered" Mixed Teaching Mode of College Physics. Physics Bulletin, 2023(7): 12–16.

[8] Liu L, He M, Wu G, et al., 2023, Research on Teaching Organization and Teaching Evaluation Reform of College Physics Online and Offline Mixed Courses. Physics Bulletin, 2023(12): 29–33 + 37.

[9] Wang H, Wu P, Qi G, et al., 2022, Research and Case Analysis of Stratified Teaching Under Blended Learning. China Educational Technology and Equipment, 2022(13): 1–7.

[10] Chen H, Wang J, Zhu C, 2024, Research and Practice Exploration on Classification Evaluation of Graded Teaching of "College Physics" in Mixed Editing Class. Education and Teaching Forum, 2024(22): 25–28.

[11] Wang J, Liu B, Yu H, et al., 2022, A Practical Exploration of College Physics Mixed Teaching Model Based on Superstar Learning. Modern Vocational Education, 2022(35): 135–137.

[12] Li L, Tao P, Wu Q, et al., 2022, Exploration of College Physics Teaching Based on Online and Offline Hybrid Teaching – A Case Study of Zijin College of Nanjing University of Science and Technology. Physics Bulletin, 2022(10): 10–14.

[13] Yang R, 2022, The Mixed Teaching Reform of College Physics in the Era of Internet+. Proceedings of the 2022 Modern Education Curriculum Construction and Teaching Reform Forum (2), Daqing Normal University; China Education Innovation (Beijing) Culture Media Co., LTD., China Global Culture Press, 6.

[14] Xu L, Wang H, Li Z, et al., 2023, Exploration and Integration of "Curriculum Thought and Politics" in Blended Teaching of College Physics. Physics Bulletin, 2023(1): 73–76 + 123.

[15] Bu Q, Ye H, 2023, Exploration and Practice of "Fine, Mutual and Identical" Mixed Teaching Mode in College Physics. University Education, 2023(2): 102–104.