Research on the Application of AI Technology in College Physics Teaching

Chenxu Li, Yingni Duan*

School of Medical Engineering and Technology, Xinjiang Medical University, Urumqi 830017, Xinjiang, China

Abstract: With the development of the times, China's comprehensive scientific and technological level has been significantly improved, and AI technology has played an extremely important role in many industries. Applying AI technology to college physics can provide great support for the development of subsequent teaching work, enrich the content of college physics, and greatly improve students' learning efficiency. In view of this, this paper will analyze the application of AI technology in college physics teaching and put forward some strategies, which are for reference only.

Keywords: College physics; AI technology; Application

1. Overview of AI technology

AI technology is an emerging type of technology. It differs from traditional intelligent systems to a certain extent and has also achieved major breakthroughs in technology. Generally speaking, AI technology refers to the accumulation of target data through simulation after receiving system instructions, thereby laying a solid foundation for the execution of subsequent project tasks. Through AI technology, comprehensive processing can be carried out on a large amount of data, and global and systematic control can be implemented based on the actual working status of the whole and local parts[1]. In addition, AI technology can process some irrelevant and real-time updated data content, sort out and collect the sources of these data, and provide users with real-time information (such as the processing and execution of some materials) according to their needs. AI technology itself has a strong ability to integrate resources, which can ensure that users grasp key information in real time. By integrating various types of data and information, people can obtain more data resources and improve the efficiency of information transmission[2].

2. The application value of AI technology in college physics teaching

2.1. Greatly enriching teaching resources

The integration of AI technology into college physics teaching facilitates the incorporation of more high-quality teaching resources into classrooms, playing a crucial role in enriching teaching resources. In college physics instruction, besides conducting teaching activities based on textbook content, we also actively utilize tools such as the Internet and AI

technology to introduce a large number of high-quality resources (including images and videos) into college physics classes. This provides students with learning materials that are more attractive, engaging, and educational[3]. Furthermore, the abundant reserve of AI-based teaching resources can fully meet the personalized learning needs of students at different levels and with different characteristics. It further expands the depth and breadth of college physics courses, laying a solid foundation for higher-quality experimental teaching.

2.2. Effectively expanding teaching approaches

Compared with traditional college physics teaching, the introduction of AI technology enables teachers to interact and communicate with students about knowledge more efficiently. It effectively breaks down the temporal and spatial barriers between students and physics knowledge, narrows the distance between teachers and students, and enhances the effectiveness of talent cultivation[4]. Meanwhile, leveraging the advantages of AI resources, students can access the required physics knowledge anytime and anywhere, and teachers can promptly address students' doubts through Internet-based methods, further optimizing students' knowledge systems. In addition, we have established AI-supported independent learning platforms based on students' varying academic conditions, which further broaden students' learning approaches, stimulate their learning initiative, and improve the effectiveness of talent cultivation.

2.3. Significantly diversifying activity forms

Traditional college physics classrooms often suffer from problems such as monotonous teaching activity forms and insufficient teacher-student interaction, which are not conducive to highlighting students' dominant position in the classroom. By introducing AI technology, we can gradually create a more efficient atmosphere for teacher-student interaction and student-student interaction. This effectively stimulates students' interest in learning and deepens their understanding and application of the physics knowledge they have learned[5]. At the same time, AI technology can greatly diversify the forms of talent cultivation activities, allowing students to conduct knowledge exploration in a more interesting and autonomous environment. This is of great significance for improving the teaching effect of college physics.

3. Problems in college physics teaching

3.1. Unreasonable information resources, failing to meet students' needs

At present, AI-based teaching in China is still in its initial stage. When many teachers apply AI technology in their teaching, they are not proficient in the technical means used, and there is significant room for improvement in their overall AI literacy[6]. Additionally, constrained by traditional teaching habits, their application of AI resources and introduction of educational methods are not sufficiently rational, which to a large extent hinders the efficiency of AI technology application in college physics teaching. In physics classes, many teachers start teaching without a deep understanding of students' learning needs. During classes, they use the same AI resources and internet-based technical tools for teaching, failing to recognize the differences in students' comprehension abilities and learning interests. Instead, they adopt a "one-size-fits-all" approach to explain knowledge. Unlike the teaching process in traditional classrooms, this method cannot reflect the characteristics of AI technology application, such as targeted guidance and personalized teaching. As a result, it fails to meet the differentiated needs of students in learning physics courses, thereby affecting their learning quality[7].

3.2. Lack of a professional AI teaching team

For teachers to rationally apply AI technology in college physics classrooms, they not only need to update the teaching software and tools they use daily but also change their previous educational concepts and teaching formats, while continuously improving their information-based teaching capabilities. However, at this stage, few teachers have a deep understanding of AI technology; some even hold the view that playing a few AI videos for students during college physics teaching is equivalent to applying AI technology[8]. From the perspective of professional capabilities, many current teachers

lack the corresponding ability to process videos and images. This greatly reduces the effectiveness of their application of AI technology in physics classrooms, thus impacting the quality of talent cultivation.

3.3. Insufficient attention and monotonous teaching formats

At this stage, many teachers do not pay enough attention to physics courses. During teaching, they rarely place students in the dominant position, leading to most students only passively accepting physics knowledge. Few students can actively express their opinions, resulting in seriously insufficient course participation. In terms of teaching formats, the teaching mode of college physics is somewhat monotonous. Many teachers have not changed their inherent educational concepts and often adopt a "cramming" teaching method when conducting physics teaching, which largely hinders the improvement of physics teaching effectiveness[9]. Furthermore, although some teachers subjectively hope to try to transform the teaching format of college physics, they lack the corresponding innovative teaching capabilities. This leads to insufficient depth in current physics teaching, with many students only having a superficial grasp of the knowledge they have learned, and the overall teaching format being very rigid and monotonous.

4. Application strategies of AI technology in college physics teaching

4.1. Using AI for lesson introduction to stimulate students' interest

To further enhance the application effect of AI technology in college physics teaching, we must deeply explore the great potential embedded in the pre-class introduction session. In fact, a well-designed and high-quality lesson introduction can quickly and effectively shift students' attention from the relaxed state of break activities to a focused and engaged classroom learning atmosphere, thereby laying a solid and stable foundation for the entire lesson's learning process[10]. However, when reviewing previous college physics teaching practices, it is not difficult to find that a considerable number of teachers have failed to fully recognize the crucial role of the pre-class introduction session in their actual teaching. They often only simply ask students to browse the textbook before class to gain a superficial preliminary understanding of the theoretical knowledge to be learned, and then hastily proceed to the formal teaching process. This formalistic and superficial teaching method obviously makes it difficult to ensure that students can quickly concentrate their attention and fully engage in the learning state at the beginning of the course, which inevitably has a negative impact on the overall teaching effect.

In view of this, we should actively embrace and make full use of the unique advantages of AI technology to carefully design and arrange the pre-class introduction session. Specifically, we can carefully select and play a series of attractive, interesting, and well-guided AI video materials[11]. These video contents should not only closely align with the core knowledge points of the college physics course but also subtly stimulate students' curiosity about unknown fields and their strong desire to explore. Through this vivid, intuitive, and entertaining approach, we can not only create a relaxed and pleasant learning atmosphere for students but also lay a solid and extensive cognitive foundation for the subsequent in-depth and systematic teaching activities, thereby effectively promoting the overall improvement of college physics teaching quality.

4.2. Introducing AI media videos to enrich teaching content

An in-depth analysis of college physics textbooks reveals that their content exhibits a certain degree of monotony. Meanwhile, limited by the space of textbooks, the explanation of many knowledge points is still insufficiently comprehensive, which undoubtedly hinders students from constructing a sound college physics knowledge system to a certain extent[12]. In the application of AI technology in college physics teaching, only a small number of teachers can proactively adopt AI technology and actively search for and integrate relevant AI teaching resources from online platforms, which is obviously not conducive to improving the application quality of AI technology in college physics teaching. In view of this, when promoting the application of AI technology in college physics teaching, we should actively explore and

utilize modern teaching methods such as AI media videos, collect video resources closely related to the teaching content from the Internet, and display them to students through multimedia equipment, thereby enriching the teaching content and improving the teaching effect. To ensure that media video resources can fully play their role, we also need to classify students according to their levels when selecting video resources to meet the learning needs of different students. We can divide students into different levels based on factors such as their cognitive ability, knowledge reserve, and interest orientation[13]. For example, students with a solid foundation in physics knowledge and strong learning initiative can be defined as top-performing students; students with relatively weak knowledge reserves and who need to improve their learning initiative can be defined as underachieving students; and students who fall between the two can be classified as average-performing students. For students at different levels, we should provide corresponding media video resources to better help them understand and master the knowledge they have learned.

4.3. Establish a self-learning platform and cultivate self-learning habits

To further improve the quality of AI technology application in college physics teaching, we must attach great importance to cultivating students' self-learning ability. By actively guiding students to develop good self-learning habits, we can significantly enhance their in-depth review of college physics knowledge, thereby strengthening their ability to master and apply such knowledge. However, in previous college physics teaching practices, students generally lacked high-quality independent learning experiences, mainly due to the absence of an effective self-learning platform. During the self-learning process, students often struggle to quickly solve the problems they encounter. This not only affects their learning efficiency but also may have a negative impact on their self-learning mindset and confidence, thereby hindering the development of good self-learning habits. In view of this, we should combine the actual situation of our university, make full use of AI technology, and build a bridge for students' AI-supported self-learning to help them solve problems encountered in self-learning in a timely manner[14]. When students encounter bottlenecks in the self-learning process, they can try to upload their problems to the AI self-learning platform and leverage the collective wisdom of teachers and classmates to solve them together, ensuring the smooth progress of self-learning. In addition, during college physics teaching, we can also use the after-class assignment function of the AI self-learning platform to regularly release questions closely related to college physics knowledge, guiding students to learn relevant knowledge and improve their skills anytime and anywhere. After completing the assignments, students can share their experiences, error analyses, and other content, thereby promoting the overall improvement of the college physics proficiency of the entire class. Through the implementation of this series of measures, we will be able to effectively promote the innovative development of college physics teaching and lay a solid foundation for students' all-round development.

4.4. Integrate online resources and improve the knowledge system

Teaching materials serve as the cornerstone for teachers to apply AI technology in college physics teaching, and their importance is self-evident. Teachers can select appropriate teaching materials, which can significantly improve the subsequent efficiency of college physics teaching and make the teaching work achieve twice the result with half the effort. Therefore, teachers should fully consider the characteristics of different students, carefully select suitable AI-assisted teaching materials for them, and realize the in-depth integration of students' personal abilities with college physics teaching materials, laying a solid foundation for students' future career development. When selecting AI-assisted teaching material resources, we should focus on the practical application value of college physics knowledge and ensure that the teaching materials incorporate knowledge content that is practically helpful for students' employment[15]. At the same time, we can also use AI methods to conduct in-depth research on the specific needs of enterprise positions for college physics knowledge, thereby further enriching the content of college physics teaching and improving students' knowledge system. Through this series of measures, we can not only improve the quality and effect of college physics teaching but also better cultivate students' practical ability and innovative spirit, providing strong support for their future career development. For example, when teaching experimental knowledge, we can try to introduce some online AI resources into the classroom.

This helps students gain a deeper and more comprehensive understanding of the application of relevant knowledge in real life and work, promotes students to develop a more in-depth understanding of the corresponding experimental content, and implicitly helps students build a more complete knowledge system of college physics experiments, facilitating their long-term development.

5. Conclusion

In summary, to further enhance the application effect of AI technology in college physics teaching, we should analyze the current status of AI technology and college physics teaching, and clarify the value of applying AI technology to college physics teaching. This will lay a solid foundation for subsequent work such as integrating online resources, establishing self-learning platforms, and introducing AI videos, and promote the effect of college physics teaching to a new level.

Funding

References

[1] Wu F, Qiao Q P, 2024, Application of Virtual Simulation Technology in College Physics Teaching. Journal of Henan Finance & Taxation College (Natural Science Edition), 33(4): 61-64.

[2] He Y, Sun Y Y, Xie D, 2024, et al. Construction and Practice of College Physics Courses Based on Knowledge Graph. Physics and Engineering, 34(6): 149-157.

[3] Li Y Q, Li P J, Wang Y, 2024, et al. Exploration of the Path to Deep Integration of "Party Building + Employment" Work in Universities—Taking Undergraduates of the School of Physical Science and Technology of Lanzhou University as an Example. Office Operations, 2024(19): 164-167.

[4] Jiang H, 2024, Application of Information Technology in the Construction of Online College Physics Courses. Telecommunications World, 31(7): 87-89.

[5] Xu C Y, 2024, Design and Practice of College Physics Courses in Agricultural Engineering Major—Review of Ecological Agricultural Engineering Science and Technology. Journal of Irrigation and Drainage, 43(7): 114.

[6] Zhang W, Yang Y J, Bi P, 2024, et al. Digital Intelligence Technology Creates a New Paradigm for Blended Teaching of College Physics Courses. Physics and Engineering, 34(3): 117-122.

[7] Jing T, Liang D M, 2024, Research on the Teaching Mode of the Deep Integration of College Physics Teaching and Information Technology. Qinzhi, 2024(4): 169-171.

[8] Gu Y T, Wang Z Y, Lu D W, 2024, College Physics Experiment Tutorial. Chemical Industry Press, Mar. 2024, p. 229.

[9] Dong Z B, 2024, University Laboratory Science and Technology. Shaanxi Science and Technology Press, Jan. 2024, p. 149.

[10] Wang J Y, Zhou T, Li X Q, 2023, Exploration of Innovation in Postgraduate Teaching Management Mechanism under the Background of "Double First-Class" Construction—Taking the School of Physical Science and Technology of Southwest Jiaotong University as an Example. Heilongjiang Education (Theory and Practice), 2023(12): 65-67.

[11] Wan X, Ding Z J, 2023, Cuspea and the Development of Physics Teaching in the University of Science and Technology of China. Higher Education of Sciences, 2023(6): 81-89.

[12] Yang S, Zhang X X, 2023, Professor Yang Zhesen from the School of Physical Science and Technology of Xiamen University Explores the Scientific Research Depths of Non-Hermitian Systems. China High-Tech, 2023(19): 9-10.

[13] Zhou H, Zhao C L, Liu K Q, 2023, Practice and Exploration of Organized Scientific Research Activities in University Physics Disciplines—Taking the School of Physical Science and Technology of Soochow University as an Example. Education Observation, 12(28): 1-3, 17.

[14] Zhang D G, Zhao J D, Zhang Z L, 2023, et al. Practice and Research on Online Assessment of College Physics Experiments under Information Technology. Technology Wind, 2023(26): 144-147.

[15] Liu W, Liu S K, Guo C L, 2023, College Physics Courses Combining Computer Science and Technology Major under the FT Course Construction Model. Guangxi Physics, 44(3): 39-41, 44.