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Application of AI-assisted Teaching in Practical Courses

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ABSTRACT

Practical courses are the key means to cultivate students' practical skills and solve problems. There are still some practical problems in its effective implementation, such as insufficient teacher guidance, lack of hardware resources, and extensive evaluation methods. With the aid of intelligent assistance and analysis, artificial intelligence can simulate the surgical environment, provide students with personalised training paths, analyse the operation process in real-time, and give accurate feedback, making up for the defects of traditional practical education. Therefore, this paper discusses the method of combining artificial intelligence technology with practical courses to provide students with more operational and practical experience in their teaching.

KEYWORDS

AI assistance; AI teaching; Practical courses

1 Introduction

Practical courses serve as a bridge to combine theory with practice, playing a positive role in cultivating high-level professionals with strong innovative abilities and the ability to tackle practical problems. In actual situations, it is challenging for a teacher to consider the details of a large number of students' practice operations simultaneously. Some instruments are more expensive, and some experimental conditions are more dangerous, which affects the opportunities for students to operate. The emergence of artificial intelligence opens up a new way to solve the above problems: through artificial intelligence, students can simulate complex or realistic operation scenarios and practice repeatedly; It can automatically track and identify the actions and effects of students during experiments and assignments, providing timely feedback. Therefore, this paper will discuss the development of artificial intelligence technology in the current practical curriculum, aiming to help teachers better implement practical teaching activities.

2 The concept and characteristics of AI-assisted teaching in practical courses

2.1 The definition and characteristics of AI-assisted teaching

AI-assisted teaching utilizes artificial intelligence technology in educational activities to support teachers' teaching processes, promote students' learning, and leverage intelligence to address the limitations of traditional teaching, thereby improving the efficiency and effectiveness of teaching. The primary feature of AI is its ability to process information, such as identifying a student's steps, analyzing the results of a task, and relying on preset rules or learning experiences to make initial judgments or recommendations about predetermined content. For example, AI's assembly guidance system can determine whether the student's assembly process is correct and provide tips on key points to improve it. The system can be based on the students' learning progress, operational level, as well as the results of feedback, follow-up learning content, or the difficulty of the task, to facilitate dynamic adjustment and provide personalised support for different students. The AI assistant is not only to provide information to the student, but also to understand the student's movement, voice, and operation choices, and give the corresponding meaningful responses or guidance [1].

2.2 Features of practical courses

The primary goal of practical courses is to enable students to apply theoretical knowledge to solve specific problems and complete tasks under real-world or simulated conditions [2]. In contrast to theoretical courses, practical courses have a distinct characteristic, primarily focused on hands-on operations and skill acquisition. The learning process is largely dependent on students' actual operation and repeated practice in a specific physical or simulation environment, and they have accumulated experience in actual operation, mastered procedures, and become proficient in movements and skills, such as, in the lathe training, learned how to use the lathe for metal parts processing. At the same time, the evaluation of practical courses also often focuses on whether students can successfully perform operational and functional tasks or solve practical problems, rather than just obtaining simple answers. In production practice, due to the influence of various uncertain factors such as equipment state, material differences, operational errors, and environmental disturbances, higher requirements are placed on learners. The above characteristics make practical teaching require the dynamic characteristics of "Situational", "Process guidance", and "Supporting resources".

2.3 The empowering role of AI technology in practical courses

Based on the basic characteristics of practical courses, artificial intelligence technology provides three major supporting roles for them. In terms of learning resources and scenarios, artificial intelligence simulates operational tasks that are difficult, costly, and risky by constructing or supporting highly realistic virtual environments. This provides safe, low-cost, and repeatable training opportunities for students. For example, in the field of chemical engineering, through virtual simulation experiments, students can master the process without touching the real hazardous chemicals. In-process assistance and real-time feedback: Artificial intelligence can automatically track and identify the actual operation steps, motion trajectories, and operation results of students through sensors, cameras, and other technologies. Moreover, it can provide timely, targeted tips, corrective action, or basic evaluation, thereby achieving a one-on-one, real-time psychological counseling effect. In auxiliary learning assessment and personalized path planning, AI can comprehensively record and analyze students' homework data throughout the entire process of actual homework, thereby generating richer learning images than individual results [3].

3 The application fields and technology realization of AI-assisted teaching

3.1 Intelligent teaching platform and tools

An intelligent teaching platform and tools are a teaching support system based on technical means, with optimizing its organisational structure and operational processes as its core. Its main functions include: assisting teachers in curriculum management, standardizing student operations, and recording learning trajectories. It includes planning the practice process, clearly outlining the operational process, step decomposition, matters requiring attention, and providing students with a structured implementation framework. During the practice phase, implementing the operation process guidance will automatically prompt key node requirements, and a warning will be issued when students deviate from the basic rules. For example, on the welding training platform, the tool can prompt whether the electric current range is normal and the operation method is standard in real time according to the preset process parameters, to prevent basic errors; Responsible for students' learning progress records, accurately record the time, steps and results of students' participation in tasks, and establish basic teaching documents. Such tools are primarily designed to facilitate the implementation of standard procedures and basic operational guarantees in the teaching process, reduce teachers' workload in supervising affairs, and enable them to focus more on creative teaching guidance [4].

3.2 Data analysis and learning feedback

Data analysis and learning feedback primarily focus on how to utilise practical information to guide students' improvement and inform teachers' decision-making. The core logic lies in the recording of behavior, the identification of rules, and the making of suggestions, forming a closed loop of"Operation——feedback——optimization”. The process involves data collection, which includes obtaining actual operational information through sensors and system logs, such as tool movement trajectories, processing time, and workpiece size deviation values. Pattern extraction involves comparing predefined standards or common patterns within a group to identify key operational points that require optimization. For instance, it can be used to assess issues such as a particular student repeatedly causing low surface precision of a workpiece due to inappropriate selection of cutting speed. The application support is used to transform the analysis results into targeted suggestions, and for students to put forward suggestions for improvement operating points ("Please pay attention to the impact of processing speed on the processing surface finish"); Organize the key issues for teachers in stages ("This class needs to strengthen guidance on the control of tool feed rates"). The key is to provide fact-based learning guides that help teachers identify teaching difficulties and enable students to focus on areas where they need improvement in their abilities [5].

3.3 Virtual experiments and simulation teaching

Through the construction of a digital simulation environment, we provide students with an alternative training environment from three aspects: resources, security, and cost. Its main advantages are reflected in three levels: through artificial intelligence simulation, allowing students to perform high-risk operations, such as fault handling training for power distribution networks, to avoid real electric shock hazards; resource availability assurance, breaking the limitation of physical equipment on time and space, such as the principle understanding of high-end precision instruments can be learned through 3D interactive models without the support of physical equipment; improving the fault tolerance of training, enables participants to rehearse key steps over and over without the use of physical materials. For example, through digital simulation, students can achieve precise positioning of blood vessels without the need for physical materials. The core function of a virtual environment is to provide an effective auxiliary tool for physics teaching, which is not only suitable for intensive training of basic skills but also for high-risk operation training, allowing students to obtain core operational experience safely and efficiently.

4 The implementation strategy of AI-assisted teaching in practical courses

4.1 Curriculum design and implementation of AI-assisted teaching

AI-assisted teaching is the effective integration of technology and practical courses, along with the scientific planning of the scope of responsibility for human-computer coo. elttion. It is an important part of curriculum design, clearly defining the basic supporting functions of technical tools, such as operation guides and data collection. In the core skills guidance, problem-solving and creative ability training, teachers strictly maintain their leading position. In the design process, we need to consider the following aspects: content matching, to ensure that the tools and resources provided by the system match the course objectives, for example, electrician training should set up circuit debugging guidance module; The degree of integration with the process, in the whole process of pre-class preview, classroom practice and after-class feedback, the operation tips and progress tracking function naturally into it; Flexibility guaranteed: teachers have the right to adjust the use of technology according to the teaching situation on the spot. For example, in mechanical assembly training, the system can guide students through identifying the assembly process of standard parts; however, for optimising assembly strategies and adjusting tolerances, teachers still need to analyse and guide on the spot.

4.2 Adaptation and training of teachers and students

Promote the effective use of AI by students and teachers, with a focus on targeted role-switching training. Teacher training focuses on the reconstruction of functional understanding and teaching style: teachers need to understand the logic of the tool and the methods of data interpretation, such as how to view progress reports and how to explain abnormal homework markers; In this process, the instructor adjusted the focus of teaching, from the teaching of basic knowledge to the analysis of operational difficulties, innovative application of heuristic teaching. For example, after a centralised air flow setup error, provide feedback to a welding instructor who should focus on explaining the principles of gas protection for various metal materials, rather than repeating the procedures. The trainees' training should focus on understanding the tools and strengthening learning awareness. We need to guide the students properly, such as using the real-time clues and feedback functions of the system, and pay attention to the dialectical relationship between instrumental assistance and actual initiative. For example, in chemical process simulation, it is essential to note that the parameter setting of the system serves as a reference only; ultimately, whether the final process route is reasonable depends on students' analysis of reaction phenomena.

4.3 Continuous innovation and optimization of educational technology

The sustainable development of technology applications requires a teaching approach driven by the improvement of applicability. The core of development is targeted optimization based on real teaching scenarios. It is necessary to pay attention to the improvement of functional practicability, and repair the existing pain points based on teacher-student operational feedback, such as simplifying the input steps of complex operation instructions, enhancing the authenticity of physical responses in virtual environments, and focusing on the improvement of information effectiveness, optimizing the presentation and interpretation logic of data analysis results. For example, replace the "Cutting speed deviation" prompt with "Speed Adjustment recommendation: 10% reduction based on current material thickness".In the process of innovation, two contradictions should be balanced: the forward-looking exploration of technology should not interfere with the stability of existing teaching, such as the laboratory trial of new motion capture systems should be separated from conventional teaching; Function upgrade should give priority to the reliability of the operation, such as remote control module update after strict security verification. Technical adjustments should always focus on solving teaching problems, rather than pursuing leading technical parameters, in order to realise their value as an educational carrier.

5 Conclusion

This paper argues that AI tools should play a supporting role in practical teaching, establishing the core guiding role of teachers in cultivating students' abilities. The rational use of technology should prioritise teaching effectiveness as its core, establish a clear boundary between human-computer collaboration, and achieve standardised system guidance and data entry. Teachers should then focus on analysing complex problems and deepening their abilities. Therefore, educators should strictly limit the scope of technical means in the curriculum design process and strengthen teachers' and students' understanding of instrumental auxiliary attributes and practical subject responsibilities during training. Only when technical means effectively serve the realisation of teaching purposes and are supported by effective systems can teachers' professional wisdom be fully utilised, and the quality of practical curriculum can be fundamentally guaranteed.

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