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Research on the Strategy of Artificial Intelligence Education in the Information Technology Curriculum of Primary and Secondary Schools

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Abstract: The development of science and technology has ushered in the era of artificial intelligence. This development affects school education in terms of information technology curriculum. The improvement of China's national strength has led to the widespread of information technology education in primary and secondary schools. In this context, this paper studies artificial intelligence education in terms of its curriculum in primary and secondary schools.

Keywords: Primary and secondary schools; Information technology curriculum; Artificial intelligence education; Educational strategy

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1. Introduction

The development of artificial intelligence (AI) technology has led to its extensive use in many fields. Schools play a significant role in cultivating the pillars of the country. The "New Generation of Artificial Intelligence Development Plan" issued by the State Council in 2017 clearly mentioned that AI courses should be set up in primary and secondary schools. It also encourages the introduction of programming into the syllabus and the integration of AI and science education. Information technology courses within the curriculum have become prime avenues for this integration. However, this integration necessitates a good understanding of both types of content by the teachers. This paper focuses on examining the integration of AI education into the information curriculum of primary and secondary schools. It addresses three key aspects: the significance, current status, and strategies of AI education. By doing so, the aim is to align with national policies and cultivate intelligent talents suited for the demands of the new era.

2. Problems of AI education in the information technology curriculum of primary and secondary schools

2.1. Insufficient emphasis on AI education

Many teachers perceive AI as a complex and daunting technology. Without specialized theoretical knowledge, they may feel intimidated by AI and choose to ignore it, resulting in superficial engagement with the subject [1]. In some cases, experienced teachers may become weary of AI and overlook its significance.

2.2. Improper teaching methods

Previously, textbooks on AI for primary and secondary education often lacked relevant theoretical knowledge, neglecting to explain basic concepts and provide in-depth analysis of key technologies. Consequently, information technology courses in these schools predominantly focused on theoretical instruction, with limited practical application and case analysis [2]. Furthermore, most teachers lacked experience in teaching AI, hindering their ability to effectively achieve educational objectives and enhance students' cognitive and practical skills. Moreover, the scarcity of hardware and software resources further impeded the development of AI education in schools [3].

2.3. Lack of AI education team

Currently, the majority of universities in China do not offer dedicated programs in AI, and the demand for AI talent remains relatively low. However, the growing importance of AI has prompted increased attention and investment in this field. Consequently, universities face challenges in recruiting qualified faculty for AI programs, leading to potential issues with teaching quality. This shortage of instructors poses a significant obstacle to the introduction of AI courses in primary and secondary schools [4].

3. AI education strategies in information technology courses in primary and secondary schools

3.1. Stimulating students' interest using AI

Artificial intelligence is increasingly prevalent in our daily lives, and while it may seem abstract, students often encounter AI-related examples in their everyday experiences. Teachers can help by uncovering such instances, thereby boosting students' interest and understanding of AI. For instance, the ubiquitous presence of smart electronic devices, particularly smartphones, offers myriad applications that enhance convenience. These devices have replaced traditional tools and, in some cases, employ AI systems for tasks like image and object recognition. Teachers can leverage students' familiarity with smartphones to illustrate AI concepts in their lives [5]. They can pose questions such as, "Why do you prefer reading the news on Baidu?" or "How does the Meituan app know your favorite food?" By guiding students through these inquiries, teachers can demonstrate how AI analyzes user behavior to make recommendations. This prompts students to realize AI's ability to understand human activities and habits, showcasing the allure of deep learning [6]. Building on this foundation, teachers can delve deeper with probing questions like, "What other aspects of our lives involve AI?" This encourages students to further explore and analyze real-life scenarios, facilitating a better grasp of AI's basic principles and applications. Through practical engagement, students not only comprehend the logical connections and technological capabilities of AI but also develop their own perspectives on its significance [7].

3.2. Using AI for maker education

Maker education combines project-based teaching and students' learning interests to foster independent learning

and innovation. Through collaborative projects, students develop teamwork skills while enhancing their knowledge. Combining makerspaces with AI can address issues like low classroom engagement by allowing students to learn at their own pace and according to their interests. Primary and secondary students often struggle with advanced AI algorithms due to gaps in their knowledge base and cognitive abilities [8]. Maker education addresses this by engaging students in projects with simpler AI concepts, allowing them to apply theoretical knowledge in practical settings. This approach nurtures creative thinking, improves information technology skills, and cultivates independent problem-solving abilities. Ultimately, it elevates students' overall learning outcomes [9].

3.3. Using AI to build an education system

primary and secondary school students have limited exposure to computer programming languages and possess minimal understanding of programming design. To foster their interest in learning, teachers should focus on making the content of program design relevant to real-world problems. By presenting programming challenges within authentic contexts, students become acquainted with the practical issues that programming can address. Teachers should adopt a problem-oriented approach tailored to students' cognitive abilities, integrating real-life scenarios to guide students in grasping the core logic of programming. This progressive teaching method enables students to advance gradually in their learning journey [10].

Moreover, students should learn programming logic to build a foundational understanding. Real-world examples can enhance their comprehension and engagement. For instance, they can learn nested repetitive loop functions by creating a rotating graphics application. They can also explore the "what if" function through an intelligent computer application. Finally, functions like "and," "clone," and "random number" can be taught by building a vacuum-sweeping robot [11]. These hands-on experiences solidify programming concepts while fostering creativity and problem-solving skills.

Guiding students through the learning of algorithmic logic is crucial. Introducing typical mathematical problems as ideas can help students apply various algorithms in practice, facilitating a deeper understanding of abstract concepts. Once students develop logical thinking skills, they can seamlessly integrate open hardware and algorithm programs. This integration allows for innovative programming of robot actions, optimizing students' knowledge and experience. In this way, students will be able to apply what they have learned, thereby achieving the learning objectives [12]. Teachers can start by introducing students to simple robots, allowing them to experience how robots perceive their environment and imbuing them with intelligence through software integration. For instance, students can assemble a car model and program it to automatically avoid obstacles. This hands-on approach not only involves hardware assembly but also enables students to implement functions like obstacle avoidance through programming.

3.4. Utilizing AI to improve course assessment

Artificial intelligence technology can not only carry out online teaching but also assess and monitor students' learning progress. In information technology education, teachers can leverage AI for academic evaluations, leading to more focused assessments and enabling paperless exams. Automating paper grading not only lightens teachers' workload but also benefits both educators and students. For instance, in primary and secondary school information technology classes, teachers can utilize network-based evaluations. After teaching relevant content, teachers can create a randomized question bank covering the material [13]. Students then select a question from the bank to answer. Throughout this process, AI technology plays a crucial role, providing instant feedback to students, who can promptly identify and address learning gaps and errors. This facilitates targeted instruction,

ensuring students receive timely support. Moreover, alongside using AI for assessments, personalized learning records can be established. Long-term tracking of students' learning progress allows for ongoing evaluation through learning archives. By analyzing these records, teachers can tailor content to students' individual needs and maintain the pace of classroom instruction. Addressing common learning issues found in the archives enables teachers to adjust their teaching strategies, enhancing the relevance of their instruction [14].

3.5. Using AI as project media

There are currently numerous devices available for teaching information technology programming. These open project media seamlessly integrate elements of AI, catering to students' learning needs. With these integrated platforms, students can engage in information technology learning projects, using hands-on projects and practice to apply their knowledge and learning. This practical approach enhances students' confidence as they implement their own program design schemes in real-world scenarios. This fosters motivation and interest in AI development, enabling students to better align with the teaching activities. For example, when guiding students in creating intelligent fans, teachers can provide programming software expansion modules and hardware components, directing students in program design and reinforcing information technology skills. Additionally, teachers can introduce students to the principles and systems of AI, enabling them to apply their knowledge more comprehensively. Building on this foundation, students can design programs tailored to real-world situations, leveraging their practical application skills and unlocking their full potential in real-world scenarios [15].

4. Conclusion

Artificial intelligence education is poised to become a pivotal component of primary and secondary school information technology curricula, serving as a cornerstone for the continual advancement of our information-driven society. However, integrating artificial intelligence education into these curricula is not solely the responsibility of schools; it requires collaborative efforts from schools, teachers, and students alike. This paper begins by highlighting the significance of incorporating artificial intelligence education into primary and secondary school information technology curricula. It then examines the current state of teaching in this area before presenting suggestions for leveraging artificial intelligence education. These suggestions include stimulating students' interest, implementing maker education, developing educational systems, enhancing curriculum assessments, and fostering collaborative learning environments. By implementing these strategies, we can effectively integrate artificial intelligence technology into primary and secondary school campuses, ensuring that students are well-prepared for the demands of the future.

Disclosure statement

The authors declare no conflict of interest.

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