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AI + Interdisciplinary Teaching: Curriculum Design and Practical Exploration for Cultivating Innovative Talents in Middle Schools

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Abstract: Against the backdrop of the rapid development of artificial intelligence (AI) technology, middle school education is tasked with the important mission of cultivating innovative talents. This paper focuses on the "AI + interdisciplinary teaching" model, exploring its curriculum design and practical paths in cultivating innovative talents in middle schools. In particular, it combines areas such as language and characters, literary appreciation, and writing teaching in middle school Chinese instruction to analyze how AI technology can break down disciplinary barriers and stimulate students' innovative thinking and comprehensive literacy. The research shows that the integration of AI and interdisciplinary teaching can provide a new paradigm for cultivating innovative talents in middle schools, but it is also necessary to address the challenges in the application of technology and its integration with teaching.

Keywords: AI; Interdisciplinary teaching; Middle school Chinese; Cultivation of innovative talents

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1. Introduction

The Opinions of the Ministry of Education and Eight Other Departments on Accelerating the Advancement of Educational Digitalization clearly states that we should thoroughly implement the spirit of the 20th National Congress of the Communist Party of China, the Second and Third Plenary Sessions of the 20th Central Committee, and the National Education Conference, and fully implement the important requirements on education. In particular, guided by the important instructions on educational digitalization, we should deeply implement the national educational digitalization strategy, adhere to an application-oriented approach and governance as the foundation, uphold connection first, content as the core, and cooperation as the key, focus on integration, intelligence, and internationalization, expand the coverage of high-quality educational resources, promote AI to facilitate educational reform, accelerate the formation of a universally accessible lifelong education system, and help build a learning society where everyone can learn, everywhere can learn, and at all times can learn, to provide strong support for effectively responding to the new round of scientific and

technological revolution and industrial transformation and accelerating the building of a powerful education country. Educators should improve knowledge graphs, construct competence graphs, deepen the application of educational large models, promote the intelligent upgrading of the curriculum system, teaching material system, and teaching system, integrate AI technology into all elements and the entire process of education and teaching, and promote the integration of science and technology education with humanities education. We will comprehensively advance the integration of AI education in primary, secondary, and tertiary schools, develop "general + characteristic" college AI general education courses, build several university smart courses, offer high-quality information technology-related courses in primary and secondary schools, and encourage the opening of AI characteristic courses. Educators will formulate guidelines for the construction and management of digital teaching materials, develop several demonstration high-quality digital teaching materials by field and major, and support local governments, schools, and enterprises in developing digital teaching materials [1]. Schools should follow the path in line with national development in accordance with national policy documents, so as to better cultivate talents.

2. The application status and value of AI in interdisciplinary teaching

2.1. Application status

Nowadays, the application of AI technology in teaching is not only reflected in the construction of intelligent teaching platforms, the establishment of personalized learning systems, and the use of virtual experimental tools, but also in the integration of knowledge across different disciplines. For example, in terms of interdisciplinary integration, teachers can use natural language processing technology to analyze historical and cultural information in literary works, thereby better understanding the relationship between the background and emotions in poems. This not only enables students to recognize that knowledge integration is a unified whole, but also helps them integrate knowledge from various subjects more effectively [2].

2.2. Value analysis

On the one hand, the integration of artificial intelligence technology and interdisciplinary teaching can provide students with diverse learning resources, allowing them to learn according to their own interests, thereby better stimulating their learning interest and promoting their learning initiative. On the other hand, this integration enables students to discuss controversial issues, which helps cultivate their critical thinking and problem-solving abilities [3]. For instance, in middle school Chinese teaching, teachers will use artificial intelligence technology to integrate knowledge related to the article in fields such as history, art, and information technology, enabling students to understand the emotions expressed in the article from different perspectives [4].

3. Problems faced by "AI + Interdisciplinary Teaching"

3.1. Difficulties in integrating technology application with teaching

Firstly, some teachers, due to their limited receptive ability, find it difficult to effectively integrate artificial intelligence technology with disciplines, resulting in a disconnection between the two; secondly, teachers may lack an in-depth understanding of artificial intelligence technology and be unsure how to select appropriate technical tools based on the characteristics of disciplines, merely introducing them mechanically, which leads to a separation between disciplines and artificial intelligence; thirdly, some teachers, influenced by traditional

teaching concepts and methods, find it hard to accept the use of artificial intelligence technology and thus insist on using traditional teaching methods, missing the opportunity to improve teaching efficiency and quality by applying artificial intelligence technology [5].

3.2. Disciplinary barriers and complexity of curriculum design

Disciplinary barriers are like an invisible wall standing between different disciplines. Each discipline has its unique knowledge system, research methods, and discourse system. Teachers develop disciplinary thinking patterns through long-term professional learning, making it difficult for them to quickly break through disciplinary boundaries [6]. For example, science teachers may have an insufficient understanding of the humanistic connotations of liberal arts, while liberal arts teachers may feel unfamiliar with the application of artificial intelligence algorithms. This makes it challenging to integrate knowledge in interdisciplinary teaching and achieve genuine disciplinary crossover. To design courses that integrate artificial intelligence technology with multidisciplinary knowledge, teachers need to not only comprehensively consider the teaching objectives and content logic of each discipline but also assess students' cognitive levels. Only in this way can the designed content align with students' learning interests [7].

3.3. Students' dependence on technology and the cultivation of independent learning ability

With the rapid development of AI technology, it is worrying that some students have become overly dependent on it. Nowadays, regardless of the assignments given by teachers, students habitually rely on AI technology to complete them, which will reduce their independent thinking ability. Assignments are an important way for students to consolidate classroom knowledge and exercise their thinking, requiring them to apply what they have learned, conduct in-depth analysis, and solve problems independently [8]. However, the convenience of AI has led many students to abandon independent exploration and directly obtain answers, resulting in lazy and rigid thinking. In the long run, they will find it difficult to truly understand and apply classroom knowledge; knowledge will only be mechanically stored in their minds and cannot be transformed into the ability to solve problems [9].

4. Strategies for curriculum design and practical exploration in cultivating innovative talents in middle schools under the background of "AI + Interdisciplinary Teaching"

4.1. Strengthen teacher training to improve technical literacy and interdisciplinary teaching competence

On campus, schools can help teachers better master the application of artificial intelligence (AI) technology and design curriculum content more effectively through AI technology and interdisciplinary teaching training. For example, schools can invite experts to provide guidance for teachers, enabling them to raise and resolve problems encountered in teaching. After experts and scholars address these issues, each teacher is required to write a corresponding study report. Additionally, regular group meetings should be organized for teachers to reflect on their shortcomings during this period, as well as propose improvement methods and strategies [10]. Off campus, schools can adopt a teacher exchange program to allow teachers to learn teaching methods and strategies from different schools and apply them to their own school's teaching. This not only enhances their own teaching

approaches but also enriches those of other teachers. For instance, schools may send outstanding teachers to key provincial and municipal schools to learn not only the teaching content there but also interdisciplinary knowledge and the application of AI, thereby comprehensively promoting teachers' professional development [11].

4.2. Optimize curriculum design and establish a scientific interdisciplinary teaching system

Teachers can develop systematic "AI + Interdisciplinary Teaching" curriculum plans based on the teaching characteristics of different subjects and the goals of cultivating innovative talents. These plans will better clarify the teaching objectives, teaching content, and evaluation standards for each subject, thereby promoting students' all-round development. The following discussion focuses on middle school Chinese.

4.2.1. Language and character teaching: AI empowers the interdisciplinary construction of language knowledge

In Chinese teaching, teachers can integrate language knowledge with subjects such as history, culture, and science using AI technology, helping students better understand Chinese characters in textbooks. For example, teachers can use AI to carry out an interdisciplinary teaching unit themed "Historical Culture in Chinese Characters," aiming to explore the connection between Chinese characters and historical culture, and cultivate students' language perception and cultural understanding abilities. Specifically, teachers can use an AI Chinese character database to demonstrate the evolution process of characters such as " 鼎 (ding, tripod)" and " 马 (ma, horse)," while combining knowledge of bronze culture and ancient transportation methods to help students better understand the composition of these characters [12]. Subsequently, teachers can divide students into groups and ask them to use AI technology to compare the linguistic characteristics of documents from different historical periods. Some groups may point out that pre-Qin prose is simple and unsophisticated, while others may note that Tang and Song poetry is elegant and magnificent. Through this teaching method, teachers can not only help students deepen their understanding of Chinese characters but also enable them to present their findings more effectively [13].

4.2.2. Literary appreciation teaching: AI builds a multidimensional literary interpretation space

In the process of guiding students in literary appreciation, teachers can use artificial intelligence (AI) technology as a teaching aid. For example, when teaching "Interdisciplinary Appreciation of A Dream of Red Mansions", teachers can utilize visualization technology in AI to analyze the character relationships and the context of plot development in A Dream of Red Mansions, helping students better understand these relationships. Besides, teachers can also use VR technology to recreate the scenes of the Grand View Garden, making students feel as if they are in a real environment and thus better understand the integration of literature and fine arts. After students have gained a profound experience, teachers will ask them to analyze the emotions expressed in the text from their own perspectives, then compile all the students' analyses and check the alternative thinking directions provided by AI, so as to further deepen the students' comprehension abilities [14].

4.2.3. Writing teaching: AI inspires interdisciplinary creative inspiration

Students can explore new writing directions with the help of AI technology. For instance, teachers can organize teaching activities themed "Interdisciplinary Thematic Writing", aiming to guide students to integrate knowledge

from different disciplines into their writing through AI. Take the topic "The Collision Between Technology and Humanity" as an example: first, students use the search function of AI to collect materials related to relevant disciplines; second, they analyze and integrate the collected materials, and AI generates a writing outline and framework; finally, students develop their writing based on the outline provided by AI, and upload the first draft to an intelligent essay correction system for revisions. Teachers then provide personalized guidance to students based on AI's correction results, thereby better promoting students' understanding of writing knowledge [15].

4.3. Guiding students to use AI technology appropriately and cultivating their independent learning and innovation abilities

Although artificial intelligence technology has strong data processing and analysis capabilities, and can provide rich learning resources, personalized learning paths, and real-time learning feedback for teaching, it should essentially be regarded as a tool to assist learning rather than the core leading force in teaching, so that teachers can better carry out education. Teachers can use artificial intelligence technology to promote students' all-around development. For example, teachers can provide students with targeted exercises and explanations through intelligent tutoring systems to help them better grasp key knowledge points; use virtual laboratories to allow students to conduct experimental inquiries in a safe and convenient environment, thereby enhancing their practical abilities. However, if teachers focus all their teaching efforts on the use of artificial intelligence technology, it will not only make teaching lose humanistic care and personalized characteristics, but also make it difficult for students to develop independent thinking abilities. To prevent students from becoming overly dependent on artificial intelligence technology, teachers can stimulate students' curiosity and desire for knowledge by designing questions so that they can better engage in the teachers' explanations. In this process, students can not only understand knowledge in depth, but also exercise their critical thinking and problem-solving abilities; teachers can also provide students with a diversified platform for ideological collision through cooperative communication, allowing students to not only share their own views and experiences, but also listen to others' ideas and learn to look at problems from different perspectives.

5. Conclusion

This paper conducts an in-depth exploration of the application status and value of AI in interdisciplinary teaching, the challenges faced by "AI + interdisciplinary teaching", and the strategies for curriculum design and practical exploration in cultivating innovative talents in middle schools under the background of "AI + interdisciplinary teaching". It aims to provide certain references for relevant researchers.

Disclosure statement

The author declares no conflict of interest.

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