Academic Education
Publishing House
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Research of Artificial Intelligence Curriculum Construction in Chinese Primary and Secondary Schools and Countermeasures to Problems

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Abstract: **This study comprehensively analyzes the status situation of artificial intelligence curriculum construction in Chinese primary and secondary schools by systematically combing through the relevant literature, and proposes targeted countermeasures. The article firstly outlines the background of the study, pointing out that the rapid development of AI technology and its wide demand for application in the field of education highlight the importance and urgency of AI curriculum construction. By summarizing and analyzing the existing literature, the study summarizes the main problems currently faced in the construction of AI curriculum in primary and secondary schools in China, including unclear curriculum positioning, lack of teaching resources and facilities, and insufficient cultivation of teachers' professional capacity. Aiming at these problems, this paper puts forward feasible suggestions in terms of teacher education and professional development, optimization of teaching resources and environment, innovation of teaching methods and evaluation, and balanced development of regional educational resources, aiming at providing theoretical references and practical guidance for the promotion of domestic primary and secondary school artificial intelligence curriculum construction.**

Keywords: Artificial Intelligence; Primary and Secondary Education; Curriculum Construction

1. Introduction

The rapid development of artificial intelligence (AI) technology is profoundly changing all aspects of society, and the field of education is no exception. The national level attaches great importance to the popularization and development of AI education. From 2017, the China issued the New Generation Artificial Intelligence Development Plan, which guides the direction of China's AI development and aims to build a first-mover advantage by 2030.In 2018, the state issued a programmatic document on AI+education to promote the in-depth fusion of AI and education, such as the Education Informatization2.0 Action Plan, which emphasizes the use of AI to accelerate the reform of talent cultivation modes and carry out smart campus construction. Immediately followed by the Central Electrification Education Pavilion in 2021 by the Central Electrification Education Pavilion in 2021 to prepare the"Framework for Artificial Intelligence Technology and Literacy in Elementary and Middle Schools", which aims to clarify the basic content and requirements of the core literacy of the discipline of artificial intelligence in elementary and middle schools.2022 Compulsory Education Information Technology Curriculum Standard further takes artificial intelligence as one of the core contents, highlighting its important position in basic education. 2024 *"The Ministry of Education Deploys Strengthening of Artificial Intelligence Education in Elementary and Middle Schools"* notice, requiring the strengthening of AI education in elementary and middle schools, with the goal of basically popularizing AI education by 2030. A series of national policy documents clearly point out that AI education should be an important hand in cultivating future talents, and the primary and secondary school stages should take the lead in promoting the widespread implementation of AI courses to enhance students' innovation ability and

scientific and technological literacy. In actual teaching, front line teachers and school administrators also face urgent needs. On the one hand, the implementation of AI curricula can help stimulate students' interest in learning and promote the cultivation of interdisciplinary and comprehensive abilities; on the other hand, the technological complexity and rapid iterative nature of AI have posed new challenges to teachers' professional abilities and the allocation of teaching resources in schools. How to ensure scientific and reasonable curriculum design, balanced and adequate resource allocation, and timely and effective teacher training has become a key factor affecting the effectiveness of AI curriculum construction. Therefore, systematically exploring the current situation and countermeasures of AI curriculum construction in primary and secondary schools not only has important policy guidance value, but also can provide feasible solutions for actual teaching practice and help cultivate future-oriented talents that meet the needs of the times.

2. Artificial Intelligence Curriculum Research Status Situation

In recent years, the construction of artificial intelligence curriculum in primary and secondary schools has gradually become a hot area of education research in China. From the point of view of the existing research, the relevant work mainly centers on the development trend of curriculum construction, research content and results, problems and challenges faced, and the future direction of development. The research trend of curriculum construction shows a shift from theoretical exploration to practical application, and the research content covers multiple dimensions such as curriculum objectives and content design, teaching practice and model construction, and teachers' professional development; however, there are still obvious shortcomings in the areas of ambiguous curriculum positioning, insufficient teaching resources, and teachers' capacity development. Based on these problems, the researcher puts forward a multifaceted development proposal from curriculum optimization, resource support, teacher training to teaching evaluation innovation, which provides an important theoretical reference and practical guidance for the scientific development of future AI curriculum in primary and secondary schools.

2.1 Aspects of Research Content and Achievements of Curriculum Construction

Research on curriculum construction of artificial intelligence in primary and secondary schools mainly focuses on curriculum content, teaching practice, curriculum standards, and teacher quality.

Hu and Cui[1] took the core literacy of information technology (IT) discipline as the starting point to explore the parenting goals of the AI curriculum in primary and secondary schools, emphasizing the importance of four dimensions: awareness of artificial intelligence, computational thinking, procedural thinking, learning and innovation of knowledge and skills, and social responsibility. Through in-depth analysis of these dimensions, they provide a theoretical basis for the design of an elementary and secondary school curriculum on human intelligence. Mo[2] emphasizes the centrality of teacher quality in the education of human intelligence and explores the various factors that affect teacher competence. Guo et al.[3] studied the status situation of TPACK competence of some elementary and secondary school teachers in a capital city of a province by means of a questionnaire survey and semi-structured interviews, and put forward the enhancement strategies.

In summary, it can be found that the research on the construction of elementary and secondary curricula for human intelligence has gradually moved from theoretical exploration to practical application, and the content of the research ranges from the design of curricular content, teaching practice, the development of curricular standards, and the enhancement of teachers' qualities, etc. Not only do these researches provide theoretical support and practical guidance for the education of human intelligence in China, but they also provide useful references to the direction of the research in the future, and in the future, there will be more emphasis on top-level design, curriculum content design, and the improvement of teachers' qualities. In the future, more attention will be paid to the top-level design of curricula, the optimization

of curriculum content, the depth of teaching practice, and the innovation of curriculum application.

2.2 Ambiguity in the Positioning of Curriculum Construction

Analysis of the literature shows that although education on human intelligence has been promoted in China so far, research on the design of curricula on human intelligence in primary and secondary schools oriented towards core literacy, and the inadequacy of related teaching materials and curricula design, especially the lack of clarity in the objectives and the lack of unified standards or guiding documents, have led to uncertainty and inconsistency in the curriculum's objectives, contents, methods, etc. This ambiguity has affected the effectiveness of the curricula and the quality of teaching and learning, and is not conducive to the overall development of students' strengths and abilities. This ambiguity affects the effectiveness of the curriculum and the quality of teaching and learning, and is not conducive to the holistic development of students' strengths. This affects the effective implementation of IE in primary and secondary schools, especially the problems of ambiguous target orientation, thematic differentiation of content, disorganized implementation of the curriculum, weak curriculum safeguards as well as sound mechanisms for collaborative development to strengthen curriculum safeguards. Researchers are also working on a series of recommendations and strategies through different research methods, including clarifying curriculum objectives, enriching curriculum resources, and strengthening teacher training, with a view to solving these problems and promoting the healthy development of elementary and secondary education in the field of humanistic education.

2.3 The Inadequacy of Teaching Resources and Facilities

The study of Li[4] pointed out that the problems facing the elementary and secondary curricula for human intelligence include the lack of unified standards and contents of teaching materials, which leads to the dispersion of teaching resources and the generalization of teaching contents. With the help of Wang's[5] study revealed the problems

in the teaching of human intelligence curriculum in Changzhou Tan region, such as weak teachers, shortage of teaching facilities, and insufficient supply of teaching resources, which are the key factors restricting the development of human intelligence education, and Yang[6] emphasized in her study the challenges faced by developed regions in the construction of the curriculum for digital literacy, such as the lack of teaching facilities and the uneven conditions of the informatized teaching and learning environment.

In summary, although research on the construction of elementary and secondary school human intelligence curriculum has made some progress in China, there are still many deficiencies in terms of teaching resources and facilities, such as insufficient equipment and facilities, lack of teaching resources, and insufficient readiness of educational environment, etc. These problems have not only affected the development of human intelligence curriculum in China, but have also affected the quality of teaching and learning environment. The existence of these problems not only affects the quality of education in humanities, but also limits the professional development of teachers and the learning outcomes of students. Therefore, in order to promote the healthy development of education for human intelligence, it is necessary to strengthen the development of teaching resources and facilities in a multifaceted way, and to enhance teachers' pedagogical preparedness through the provision of professional support and high-quality resources.

2.4 Cultivation of Teachers' Teaching Power

Guo et al.[3] explored the status situation of TPACK competence development and enhancement strategies for teachers of elementary and secondary school artificial intelligence courses by means of questionnaires and semi-structured interviews, and found that the overall TPACK competence of teachers was at an insufficient level, and that there was a need to start from the integration of resources through multi-channels, the construction of regional collaborative communities of practice, the improvement of school incentives, and the improvement of the school's incentive

mechanism. It was found that the overall TPACK strength of teachers was at an insufficient level, and there was a need to improve teachers' pedagogical strength through multi-channel resource integration, regional collaborative community of practice construction, improvement of school incentive mechanism, and blended precision training based on the TPACK framework. In addition, Li[7] developed a system of indicators of the power of teaching thinking through the Delphi method and hierarchical analysis, aiming at helping teachers to evaluate and improve their teaching practices in order to enhance the quality of teaching. Mo[2] proposed a model of competency for teachers of elementary and middle school AI courses through the study, which emphasized the key strengths of teachers in terms of their professional knowledge, teaching practice, and innovative teaching. Other studies have shown that teachers' professional development requires training implemented in relation to specific needs, and a study revealed the correlation between different elements of teacher training and the enhancement of teachers' strength.

In summary, current research on the development of teachers' pedagogical strength in elementary and secondary school humanities courses has made some progress, but many challenges remain, such as insufficient internal motivation for teachers' professional development, insufficient teaching and learning environments, and unsystematic teacher training. Therefore, future research needs to be further deepened and more empirical studies and policy support are needed to promote the comprehensive enhancement of teachers' pedagogical strength, especially in the areas of precise enhancement strategies of teachers' pedagogical strength, comprehensive development of teaching and learning environments, and systematization of teachers' training.

3. Research on Problems and Countermeasures

3.1 Teacher Education and Professional Development

Guo et al.[8]studied the status situation of TPACK competence of elementary and secondary school teachers of a capital city in a province by means of questionnaires and semi-structured interviews, found that the overall TPACK competence of teachers was at an underdeveloped level, and pointed out that the strategies for enhancement included the construction of an educational and teaching environment, the establishment of a regional community of practice, the improvement of incentives, and training based on the TPACK framework. TPACK framework training. In addition, Mo[2] explored the structure of the competency model of teachers' strength in elementary and secondary schools' human resource courses using mixed research and evidence-based research, verified the structural validity of the competency model, and put forward suggestions for teachers' cultivation. Ning et al.[9] A five dimensional model of teacher competency characteristics for the Mythical Intelligence Curriculum was constructed and validated by means of behavioral event interviews and validation factor analysis, and suggestions for teacher training were put forward. Finally, Yin & Lin [10] found that the readiness of primary and secondary school teachers to teach the lesson of human intelligence was at a medium level through a survey study in the city of Chongqing, and put forward targeted countermeasures and suggestions. In summary, these studies not only provide important insights into the status situation of teachers' professional development in elementary and secondary schools, but also provide a scientific basis for the development of effective teacher preparation strategies.

3.2 Improvement of Teaching Resources and Teaching Environment

Feng[11] proposed an evaluation system and framework for digital+ curriculum for the practical research in Wenzhou, aiming to optimize the curriculum content, promote the balance of educational resources between urban and rural areas, and stimulate the innovative activity of students. In addition, Guo et al.[8]puts forward enhancement strategies for the study of teachers' TPACK strength development, including the construction of a teaching environment for human intelligence education and the formation of a regional collaborative community of practice in order to enhance teachers' teaching strength. Li's[7] study focuses on the construction of the indicator

system of teachers' teaching strength and emphasizes the need for teachers' strength in enhancing the teaching of thinking in students. Rong Wang and Xie[12] focus on the utilization model of curriculum resources for human intelligence and proposes an experiential learning circle-based utilization model to enhance the adaptability and effectiveness of curriculum resources.

In summary, the current research on the construction of elementary and secondary school human intelligence courses has achieved some results, especially in the optimization of teaching resources and the improvement of the teaching environment. These studies not only provide guidance for teachers' professional development, but also create conditions for the development of innovative thinking and practical skills. Future research could deepen these results, especially in the areas of interdisciplinary educational integration, continuous professional development of teachers, and the development of innovative strength of students, in order to meet the needs of education in the new era.

3.3 Pedagogy and Innovation in Teaching Evaluation

Li[7] studied the index system of teaching strength of teachers of human intelligence courses, constructed an index system containing five dimensions through the Delphi method and hierarchical analysis, and designed a corresponding assessment questionnaire to validate the index system. Rong[13] combines design thinking and scientific and technological innovation projects, constructs a teaching mode of the human intelligence curriculum based on design thinking, and proves through practice that this mode can enhance students' learning interest and creative thinking power. Song[14] designed the inquiry-based teaching mode and case of senior middle school human intelligence, continuously improved the teaching mode by way of performing research, and verified the effect of the teaching case through experimental research.

In summary, domestic research on the construction of elementary and middle school human intelligence courses is gradually shifting from theoretical exploration to practical application, and innovations in teaching methods and evaluation have become

a key way to improve the quality of the courses. As can be seen from several papers, researchers have focused not only on innovations in pedagogy to accommodate the diversity of students and to enhance the effectiveness of teaching, but also on the diversification and development of teaching evaluation to promote the development of students in a holistic manner. The combined use of these studies is expected to provide strong support and guidance for the development and implementation of curricula in elementary and secondary schools.

3.4 Balanced Development of Inter-Regional Educational Resources

Guo et al.[8]conducted a survey on elementary and secondary school teachers of the Mythical Intelligence Curriculum in a capital city of a province and found that the overall TPACK ability of the teachers was at an insufficient level, pointed out the differences in the teaching power of the teachers among the regions, and suggested that the professional development of the teachers could be promoted by setting up regional collaborative communities of practice in teaching, learning, and researching of the Mythical Intelligence Curriculum. In addition, Zhang et al.[15] constructed a framework for the curriculum system of elementary and secondary school through the development and refinement of the curricular objectives for elementary and secondary school, and proposed directions for optimizing and improving the curricula based on the assessment of students' human intellectual literacy. These studies show that through regional collaboration and resource sharing, the balanced development of educational resources can be effectively promoted and the quality of education can be enhanced. In summary, the balanced development of educational resources among regions is the key to enhancing the quality of elementary and secondary school curriculum construction in terms of human intelligence, which needs to be realized through multi-stakeholder collaboration and continuous professional development.

4. Summary

Through sorting out and analyzing the current status situation of AI curriculum construction in primary and secondary schools in China,

this paper summarizes the main problems faced by AI curriculum construction and puts forward corresponding countermeasure suggestions. These problems are mainly concentrated in the aspects of unclear curriculum positioning, insufficient teaching resources, and weak teachers' professional ability. To solve these problems, this paper proposes corresponding countermeasures in terms of teacher education and professional development, optimization of teaching resources and environment, innovation of teaching methods and evaluation, as well as balanced development of regional educational resources. The research in this paper can provide theoretical reference and practical guidance for promoting the construction of AI curriculum in primary and secondary schools, and contribute to the cultivation of innovative talents who can adapt to the needs of the future society.

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