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A Review of Artificial Intelligence Literacy Education and AI Skills Development in Chinese Universities

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Abstract: The development of AI has energised society as a whole and higher education needs to reconsider the role of AI. This study explores the definition of AI literacy, examines its framework within Chinese universities by reviewing domestic and international literature, as well as the influencing factors and measures suggested. The study finds that, although AI literacy education has brought more opportunities to the development of higher education in China, there are still some challenges, including regional disparities, insufficiently targeted policies, and students' misuse of AI tools. In response, it is essential to foster students' critical thinking skills and rethink traditional educational approaches in the AI era. Therefore, Chinese higher education leaders need to improve policies, optimise curricula, focus on students' personal development, and develop ethical standards to advance higher education. This review provides theoretical support for Chinese scholars and enriches the literature base at the intersection of AI and education.

Keywords: Artificial Intelligence Literacy, Higher Education, Policy, Students

1. Introduction

As artificial intelligence continues to evolve, human life and learning have changed dramatically. We cannot deny that AI has a natural advantage in improving efficiency, handling complex data and optimising processes. Higher education, as an important part of social development, is deeply affected by AI. Through the research, Crompton & Burke [1] found that the use of AI in higher education is very active in five dimensions: academic assessment, academic prediction, AI assistants, intelligent tutoring systems and student self-directed learning. These five dimensions not only explain how AI fits in the higher education system but also emphasise the direction and goals of higher education reform. At the same time, the development of AI in higher education can help popularise mass higher education, with academics being able to break the constraints of time and space for low-cost learning, and professors being able to reduce the pressure of their work so that they can focus more on teaching about empathetic human beings [2]. China, as an educational powerhouse, AI has an important role to play at the national strategic and economic levels. Currently, the development of AI in China is focused on two levels, from the central government to local governments and the more influential private business sector [3]. In the special dual context of being government-led and market-driven, Chinese researchers need to integrate AI into higher education in a sensible way. This is due to the clear positive impact of AI on enhancing student literacy, including self-directed learning, skill development, and cognitive building [4]. In addition, AI facilitates personalised teaching. Professors can use students' interests and personal ideas to develop teaching methods that suit individual

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characteristics, and contemporary university students are not only limited to passively receiving knowledge but also use AI to develop self-activity.

This study focuses on three main research questions: 1. How is the AI literacy education system in Chinese universities constructed and developed? 2. What are the key factors that affect the AI skills development of college students in Chinese universities? 3. How can we optimise AI literacy education in Chinese universities to improve students' AI competence? By adopting a review of domestic and international literature, this study provides an overview of the research progress on the application of AI in higher education, so as to advance the development of intelligence in Chinese higher education and provide effective literature support for educational researchers.

2. Theoretical foundations of AI literacy

2.1. Defining AI literacy

Firstly, for the definition of AI literacy, Long & Magerko [5] argued for an ability to learn critically, to use AI for collaboration and learning, and to critically use AI as a tool for production rather than applying it exclusively to the current situation. In addition, Chiu et al. [6] believed that the concept of self-reflection needs to be incorporated into the definition of AI literacy, and that stakeholders' perspectives should be taken into account in the design of AI, which is not intended to replace human beings entirely, but rather to help users to improve their self-efficacy. The use of AI requires an understanding of computers and a certain level of discernment, so AI literacy skills are to some extent applicable to higher education backgrounds. In contemporary educational settings, the core of AI literacy lies with the recipients, so students and teachers should have some basic knowledge of AI and use it in a moral and ethical manner [7]. Artificial intelligence literacy competences are not exclusive to computer experts; rather, they stem from the inherent learning and receptive abilities of human nature. Similarly, Ng et al. [8] found by examining the literature on AI literacy in recent years that it tends to be defined in terms of different types of literacy competencies, focusing more on the person themselves than on machine learning.

2.2. AI literacy education frameworks

In order to integrate AI into university courses, researchers have proposed different models and frameworks. Firstly, by examining students' experiences of AI concepts and tools in higher education courses, Tzirides et al. [9] proposed three core dimensions: pedagogical strategies (integration of multiple modes of AI tools), reflective learning (regular reflection on the experience of using AI), and ethical and critical engagement (data privacy, algorithmic bias, and evaluating the limitations of AI). Similarly, the ED-AI Lit framework was devised in order to broaden the engagement and inclusiveness of AI. The ED-AI Lit framework proposed by Allen & Kendeou [10] involved six core conceptual components, namely knowledge (understanding the underlying principles and operational methods of AI); assessment (reviewing the potential drawbacks of AI); contextualisation (using AI in specific populations and environments); collaboration (leveraging AI for collaborative learning); autonomy (enhancing one's own learning capabilities and scope of knowledge in the process of using AI); Ethics (fairness, privacy, transparency, and ethics). In contrast, AI literacy frameworks in Chinese higher education focus more on teaching staff and administrators. The framework emphasises that teachers should gradually adapt students to the future AI-driven job market, while higher education administrators should ensure students' privacy and safety and focus on addressing academic misconduct involving AI [11].

In addition, there is an imbalance in the development of AI literacy frameworks between global regions. Developing countries often face dilemmas such as limited infrastructure, a lack of relevant educational technologists, and an inability to make rapid changes to traditional curricula [12].

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Different regions exhibit significant differences in AI literacy frameworks. The AI literacy frameworks in Western higher education place more emphasis on a student-centred approach to training, developing an AI critical thinking of the student's self, and fostering a self-contained body of knowledge. In Chinese higher education, AI literacy frameworks are mostly shaped by educational leaders, who use a mentor-led strategy to transform higher education and assist students in adapting to the AI age.

3. Institutional factors affecting AI literacy education

3.1. Government level measures

In response to the advent of the digital era, the Chinese government has strongly supported the development of related industries and the training of related technicians. In the policy document 'China Education Modernisation 2035' [13], the Chinese government stresses the need to integrate big data, artificial intelligence and education technology, and to strengthen international exchanges and cooperation in order to develop a path of education development that is suitable for China. Due to China's special political environment and institutions, relevant policies regarding the development of AI can be implemented very quickly. However, there is an imbalance between regions, with coastal provinces having more targeted policies than the central and western parts of the country, and most regions simply follow government directives and lack locally applicable AI policies [14]. In addition, AI change at the national level is complex and does not require only infrastructure and large-scale investments to complete, the prerequisites for change require digital literacy and the audience's mastery of AI capabilities [15].

At the higher education level, Chinese universities have further expanded their enrolment by opening relevant AI-specific courses and colleges, and have also focused on the application of AI in other subject areas, increasing the utilisation of AI [16]. For example, applying AI to varieties of fields such as healthcare, financial manufacturing, urban planning, and retirement protection will effectively promote higher education to solve real social problems. Similarly, Abbasi et al. [17] believed that the use of AI at the higher education level will fundamentally change the structure of the curriculum, with students receiving more effective personalised learning support and increased academic engagement, and teaching staff being able to reduce their workloads and simplify their teaching strategies by using AI to break down overly rigid traditional teaching methods. In addition, Xiao & Yi [18] have also used their research to propose a training model adapted to Chinese higher education by first creating a method to extract pre-enrolment information about students, subsequently utilising this information to train a personalised AI model, and finally predicting the academic trajectory of the student's development based on the model. On the basis of this model, more attention will be paid to the personal development of students, and the university model will become more personalised, thus helping students to make the transition from academia to career more quickly.

3.2. Artificial intelligence tools in higher education

Higher education institutions are using AI to create effective library management systems. Smart libraries have faster search efficiency than traditional library models, and are able to provide more accurate search information based on the user's ideas, and automated management systems can help staff to sort, count, and return books more efficiently [19]. Similarly, for more costly practical courses, higher education venues can use AI to create a virtual lab environment and use gamified incentives (leaderboards, points) to increase student engagement and commitment [20]. Students can do experiments and look at the data from those experiments in this highly virtual environment. This not only saves the university money, but it also makes sure that the experiments are safe and can be

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changed. However, the premise of AI application should be human-centred, rather than being forced by the times to passively accept the AI-isation of higher education, and start from the needs of users [21]. In addition to this, while university teaching staff are more receptive to relevant AI tools, higher education institutions need to provide training to bridge the digital technology gap among teaching staff [22].

4. The role of students in the development of artificial intelligence literacy

4.1. Students' attitudes and perceptions of artificial intelligence

Students' understanding of and attitudes towards AI literacy are important factors that influence teaching and learning outcomes. Firstly, Ma et al. [23] found that international students' willingness to use AI is higher than Chinese students through a research comparison, and that Chinese students may be less willing to use AI because of the English language barrier. Similarly, Chinese university students, although able to interact with and learn from AI, still have a limited understanding of AI and are concerned about the potential risks of AI in the educational environment, such as dependency and reduced thinking skills [24]. Furthermore, by continuously monitoring and evaluating the AI, the researchers found that the repetitive and uncreative nature of the AI further reduces student motivation, and that frequent malfunctions and network problems distract students [25]. Conversely, there are specific disciplines and specialisms where students may have a more positive view of AI. For example, Li et al [26] found through their research that due to the emergence of AI, which has dramatically changed medicine and clinical trials, medical students have a stronger willingness to invest in AI for their future career plans.

4.2. The role of generative AI in student learning

As AI technology becomes more sophisticated, generative AI tools (ChatGPT, etc.) are often used by university students to assist with academic writing and question answering. Firstly, confronted with the question of whether generative AI can replace traditional education, the majority of students disagreed, emphasising the importance of social interaction and also proposing a blended learning model that combines generative AI tools with traditional teaching models [27]. Moreover, by investigating the role of ChatGPT in higher education, Hmoud et al. [28] found that the AI tool enhances learner curiosity and satisfaction, and helps with concentration and time saving. Students can personalise their learning at their own pace and learning ability, and the increased efficiency means that students can receive a greater volume of knowledge, further broadening their horizons. However, due to inappropriate use or ethical issues, generative AI tools tend to be more damaging to the higher education environment, with some international students and marginalised groups often caught in the middle of academic misconduct due to language barriers or lack of basic knowledge, which will further undermine educational equity [29]. Similarly, the content created by generative AI is still based on human comprehension, and tiny aspects cannot be fully recognised by the AI, making it unclear if the quality of AI-generated content will improve or decrease as technology advances [30].

5. Future directions and policy recommendations

The advancement of artificial intelligence has caused higher education providers to reconsider the purpose of education, resulting in the rise of personalised and innovative convergent approaches to education with an expanding range of writing analysis, exploratory learning, and academic mentoring in terms of learning methods [31]. But Laupichler et al. [32] believed there is currently less basic research on AI literacy and that some of the vocabulary associated with AI also needs to be updated to accommodate interdisciplinary research. Because the understanding and focus of AI in higher

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education varies greatly from discipline to discipline, and this creates differences between terminology and concepts, new vocabulary needs to be incorporated in the area of AI literacy. There is also an important trend towards using AI literacy frameworks to develop critical thinking. Instead of passive acceptance in the context of AI, students in higher education are encouraged to question and analyse in depth what AI presents to develop their analytical skills and critical thinking [33].

In terms of policy, future higher education venues will also need to be transformed. Firstly, Chinese higher education needs to accelerate the integration of AI with disciplines in other fields (biology, psychology, physics, chemistry, etc.), as well as develop students' core competencies, incorporate AI teaching into the curriculum, and shift from the traditional lecture format to AI-assisted teaching [34]. Similarly, teaching staff in higher education need to reform their own course pedagogy to emphasise classroom practice and hands-on work rather than essays and exams, and need to train students in AI literacy prior to the start of the course so that they can effectively accept a blended approach to teaching and learning [35]. In addition to this, the ethical and moral issues contained in AI are a factor that cannot be ignored. Bulut et al. [36] argued that AI in higher education needs to undergo a reassessment of technicality and safety in order to ensure transparent and effective interactions between educational stakeholders. It is also important to establish effective rules of use and ethical guidelines to eliminate misuse and invasion of privacy.

6. Conclusion

The development of Artificial Intelligence is proceeding at a rapid pace and driving change in higher education is imperative. By reviewing relevant literature, this paper discovers that the definition and educational framework of AI literacy in China are very similar to that of international studies. And the integration of AI into higher education not only improves the efficiency of teaching staff, but also promotes students' personalised learning and digital skills.

At the government level, China strongly supports the development of AI literacy education, actively promotes higher education policy reform and interdisciplinary mega-convergence, and emphasises the importance of AI in international cooperation. However, due to regional differences in educational resources and economy, AI policies tend to develop unevenly and lack effective regulatory instruments. At the student level, the emergence of AI is gradually changing the way they learn and students are willing to accept AI into higher education to enhance their digital competence for faster integration into their careers. However, students' reliance on and use of generative AI still need to be optimised, and AI literacy needs to be integrated with specific disciplines to have a profound impact on students.

Finally, in terms of AI education development and improvement measures, Chinese higher education still has a lot of opportunity to grow. Relevant educational leaders need to reconsider the direction and purpose of education, and actively promote the integration of disciplines and the development of AI terminology. In addition, the AI industry in Chinese higher education needs to further optimise its policy and curriculum structure, strengthen teacher training, and improve its moral and ethical code in order to promote the internationalisation of Chinese higher education.

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