International Journal of Social Science and Research

Int. J. Soc. Sci. Res.
2024.2(2).2
ISSN：2960-0979
https://doi.org/10.58531/ijssr/2/2/1

Article

Research on artificial intelligence literacy level and its influencing factors of high school students

Yu Yang, Xiaoshuang Xu *

Huanggang normal University, Huanggang City,Huanggang 438000 , China

Abstract: With the continuous and deep integration of artificial intelligence technology and school education, students' artificial intelligence educational literacy has become an important part of students' development, and the cultivation and improvement of students' artificial intelligence educational literacy has attracted extensive attention from the government and society. In order to accurately grasp the development status of artificial intelligence literacy of primary and secondary school students in China, and to provide decision-making basis for comprehensively and efficiently improving teachers' intelligent education literacy, this study builds a framework of intelligent education literacy of primary and secondary school teachers with intelligent education awareness, knowledge, skills and ethics based on in-depth comparative analysis of relevant standards, frameworks and existing achievements at home and abroad. The questionnaire of teachers' intelligent educational literacy was compiled to carry out empirical research, and the intelligent educational literacy of primary and secondary school teachers was measured. The study found that students have a high level of artificial intelligence awareness, artificial intelligence affection and ethics, but they still need to improve their artificial intelligence ability and knowledge.

Keywords: Artificial Intelligence literacy, high school students, artificial intelligence

1. Introduction

In recent years, with the deep integration of artificial intelligence with the economy, education, medical and other fields, it is urgent to improve the depth of ordinary citizens' cognition and application ability of artificial intelligence technology. In this context, artificial intelligence education came into being and quickly became the focus of attention and

Citation: Yang Y., Xu X. Research on artificial intelligence literacy level and its influencing factors of high school students. Int. J. Soc. Sci. Res., 2024, 2(2), doi: 10.58531/ijssr/2/2/1

research hotspot in various countries.[1]In 2017, The State Council proposed in the "New Generation of Artificial Intelligence Development Plan" that it should "set up artificial intelligence-related courses in primary and secondary schools and gradually promote programming education.".[2]In 2018, the Ministry of Education issued the "Education Informatization 2.0 Action Plan", which clearly requires "the introduction of artificial intelligence in primary and secondary school education".[3]In 2019, the Ministry of Education issued the "Key Points of Education Informatization and Network Security Work in 2019", proposing to gradually open artificial intelligence-related courses in primary and secondary schools.[4]China's Education Modernization 2035 clearly calls for accelerating the reform of education in the information age. Use modern technology to accelerate the reform of personnel training mode and realize the organic combination of large-scale education and personalized training.[5]With the gradual deepening of the application of artificial intelligence in the field of education, what qualities should students have in artificial intelligence education are rarely based on empirical system construction and lack of data support and realistic analysis. Based on this, from the perspective of promoting the level of artificial intelligence literacy and influencing factors, this study actively explores the connotation and composition of artificial intelligence educational literacy of teachers and senior high school students, and compiles a questionnaire on artificial intelligence educational literacy to analyze the current situation of artificial intelligence educational literacy of senior high school students in China, with a view to providing useful suggestions for the evaluation of artificial intelligence educational literacy of senior high school students in China.

2. Research review

2.1 Foreign research status of artificial intelligence

The Artificial Intelligence course is a new technical science education course that focuses on the research and development of theories, methods, techniques and application systems for simulating, extending and expanding human intelligence. Using Google Academic database as the literature source, the search period is from 2003 to 2023, and the subject term is "Artificial Intelligence Course", a total of about 17800 articles are retrieved, and it is found that it has maintained a high research heat in various fields. On this basis, the subject words "primary and secondary schools" were added, and the search field was limited to the scope of artificial intelligence courses in primary and secondary schools. A total of 10153 literatures were retrieved as research samples.

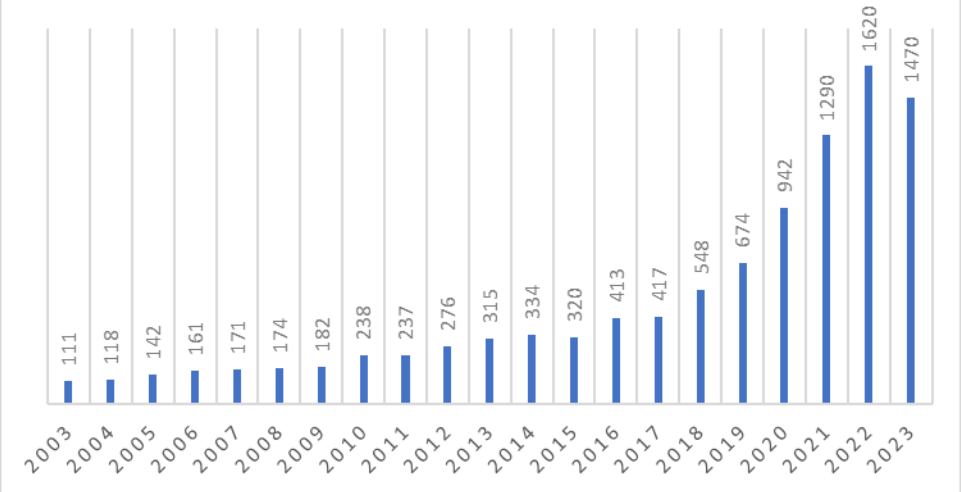

Figure1. Annual analysis of foreign artificial intelligence curriculum literature

When the term "artificial intelligence" was first proposed at the Dartmouth Conference in 1956, scientists defined it as "intelligence that causes a machine to react in a manner similar to that on which a person acts."[6]In 1999, the Scottish region of the United Kingdom added artificial intelligence courses to the ICT (information and communication technology) curriculum of secondary schools, and developed students' programming thinking in the robot course education and teaching activities. In 2013, the UK changed the previous ICT curriculum to a computer curriculum, aiming to develop students' computational thinking and creativity.[7] Between 2016 and 2018, the United States released three important national strategic reports on artificial intelligence, which considered education to be one of the most important areas for the application of artificial intelligence technology. Since then, the United States has released a series of reports on the impact of artificial intelligence on human production and life in the future, in order to promote various industries to seize new opportunities in the development of artificial intelligence technology, and actively adapt to the future scientific and technological society, so that artificial intelligence can give full play to its value.[8] In the field of education, it is necessary to explore the education reform mechanism and strengthen the training of artificial intelligence talents in order to adapt to the future era of artificial intelligence. In 2015, the United States launched the "Every Student Succeeds Act", which aims to attach importance to and promote computer science education in primary and secondary schools, and explore and cultivate students' computational thinking and data thinking. Artificial intelligence is not only an important part of computer science, but also an important means to promote the reform of education and teaching in other disciplines.[9] In 2016, Japan issued the "Japan Revitalization Strategy", indicating that artificial intelligence is a representative of the fourth industrial revolution, and young people need to actively adapt to the future era of artificial intelligence. In 2017, the Japanese Ministry of Education, Sports, Science and Technology released the "New period of Learning guidance Essentials Explanation", which pointed out that the teaching goal of Japanese primary and secondary school programming education is to help students form the "programming thinking" needed by The Times.[10] Laurene Celiew, Director of AI

Innovation in Singapore, noted that AI Singapore (AI SG) is a national AI initiative that aims to build the country's capabilities in the next generation of AI fields to make a social and economic impact and nurture national AI talent. Ai Singapore's two educational programmes on AI are "AI forKids" and "AI forStudents". "Ai forKids" is designed for primary school students to help them become familiar with and master the basics of AI, use relevant tools, and be able to proficiently apply them to solve various problems and challenges in daily life. "Ai forStudents" is geared towards development at the middle school level, where students and teachers have free access to the core content of the AI curriculum.[11] Ai Education in Australia follows the general digital technology section of the Australian curriculum, taking a different approach to promoting AI education for young people. It breaks with the general expectation that students at different grade levels acquire skills, not as an independently developed AI curriculum, but maps the AI curriculum onto this guideline. The Computer Science Education Research Group's (CSER) MOOCS project offers teachers at the elementary and secondary levels a collection of MOOCS on AI-related content that is less profitable and designed to enable teachers to start teaching people in schools Working intelligence.[12] The EU's focus in the field of artificial intelligence research is in the industrial sector, and in the White Paper on Artificial Intelligence, it is mentioned that the way to achieve "excellence" and "trusted" education in Europe is to use artificial intelligence to improve education and educate people to understand artificial intelligence, but it does not give a detailed plan for K12 artificial intelligence education. Obviously, the EU has not yet set up relevant AI courses, but the white paper proposes that the Digital Education Action Plan should be revised in order to reform the teaching and training system, and increase the AI popular science courses in all stages of education; The plan is to establish a network of the world's highest level of European universities and higher education institutions to attract outstanding scientists and professors from around the world to carry out world-class master's education in artificial intelligence.[13]

Kandlhofer explains AI literacy mainly from the perspective of AI knowledge, and believes that AI literacy is to enable people to understand the technology and principles behind AI products and services, rather than just learning how to use certain technologies. Artificial intelligence literacy and computer science literacy are divided into seven themes [14]. Artificial intelligence daPonce does not explicitly put forward the concept of artificial intelligence literacy, but still attaches importance to people's ability and literacy in the era of artificial intelligence, and believes that in the era of artificial intelligence, it is not enough for people to only master professional skills, but also must have certain artificial intelligence literacy, understanding, and data processing ability [15]. Long considers AI literacy to be a set of skills that enable individuals to critically evaluate AI technologies; The ability to communicate and collaborate effectively with artificial intelligence and use artificial intelligence tools online is considered to include digital literacy, computing literacy, scientific literacy, data literacy, technical literacy, code literacy, rhetorical literacy, and ethical literacy [16].

2.2 Domestic research status of artificial intelligence.

In this paper, the subject word "artificial intelligence course" was searched on CNKI, and 1,714 relevant literatures were retrieved, which showed an increasing trend from 2016 and increased to 1,714 so far, as shown in the analysis chart of the number of published retrieved literatures (FIG. 1.2). And the overall trend is upward, indicating that domestic research in the field of artificial intelligence education is a research hotspot in the past five years. At the same time, the number of published documents is not as large as other research literatures, which proves that this research field is relatively new.

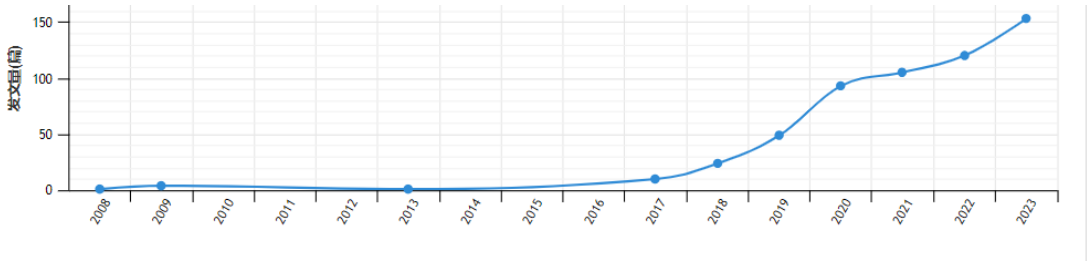

Figure 2 Annual analysis of domestic artificial intelligence curriculum literature

For what is artificial intelligence literacy, Chinese scholars have also put forward their own views and opinions. Among them, Xu Yafeng and others believe that AI literacy is the ability to carry out learning and work in the era of artificial intelligence. At the same time, they also pointed out that artificial intelligence literacy belongs to the category of digital literacy, and digital literacy includes artificial intelligence literacy, and artificial intelligence literacy is closely related to number intelligence literacy and data literacy [17]. Zhou Shaojin and Wang Fan believe that the essence of artificial intelligence education is to help students play innovative and creative ability and increase practical application experience, and ultimately promote individual development. They pointed out that AI literacy is the basic comprehensive literacy in the era of AI, and there are three stages in total: establishing an open and inclusive AI attitude, mastering AI tools and applying AI thinking to solve practical problems [18]. Liu Xinyi believes that with the rapid development of artificial intelligence, students must explore the mystery of artificial intelligence, he also pointed out that the teaching goal of the new curriculum is to allow students to understand artificial intelligence, understand its principles and how to use artificial intelligence. Second, arouse students' interest in learning artificial intelligence, so that they can gain practical experience in using artificial intelligence through personal experience. Third, after students understand and experience the application of artificial intelligence, they can understand its specific implementation process. After mastering the principles of artificial intelligence, they can realize simple artificial intelligence by writing programs, thus improving their programming thinking and practical ability [19]. Hou Hezhong and Wang Yonggu believe that both AI literacy and information literacy are for individuals, and AI literacy not only requires individuals to understand intelligence, but also to have the ability to apply intelligence and develop intelligence [20].

3. Research design and implementation

3.1 Research object and process

The main content of the questionnaire survey is the current development level of high school students' artificial intelligence literacy. The research samples are selected from Grade B high school in District G, Huanggang City, specifically for grade 2 and Grade 3 students. The reason why the students in the second and third years of high school are selected as the objects of the questionnaire is that high school students should have a basic understanding and cognition of artificial intelligence. They need to understand the basic concepts, development history and application fields of artificial intelligence, as well as the basic principles and implementation methods of artificial intelligence technology.

3.2 The design of the questionnaire

The questionnaire consists of two parts: (1) Students' personal background information, including gender, grade, etc. (2) Questionnaire of students' artificial intelligence literacy. This questionnaire comes from the Artificial Intelligence Literacy Questionnaire designed by CAI Jieru et al. [21], which is based on Peng Shaodong et al. 's Definition and Principle Mining of Artificial Intelligence Education [22]. The questionnaire system includes four dimensions: artificial intelligence consciousness, artificial intelligence knowledge, artificial intelligence ability, artificial intelligence sentiment and ethics. The Artificial Intelligence Literacy Evaluation Questionnaire for high school students includes two parts: students' basic information questions and survey scale (5-level Likert scale questions). Because the basic information questions of students are designed separately, only the latter part is selected in this questionnaire. The questionnaire has been proved to have good reliability, validity, difficulty and differentiation, which is suitable for the assessment of artificial intelligence literacy level of high school students.

3.3 Questionnaire reliability and validity test

The reliability coefficient of the total quantity table should be ensured to be above 0.8 for the best, and between 0.7 and 0.8 means acceptable. The α coefficient of the subscale should preferably be above 0.7, indicating good reliability; When the α coefficient of the subscale is between 0.6 and 0.7, the reliability of the scale is acceptable. If the α coefficient is less than 0.6, it means that the scale is not acceptable and should be revised. The intrinsic reliability of the scale as a whole is high, which is acceptable. SPSS software was used to test the reliability and validity of the whole questionnaire. The Klonbach coefficient method was used for reliability test. After analysis, the Klonbach coefficient of the whole questionnaire was 0.861. The Klonbach coefficients of the specific dimensions of factor 1, factor 2, factor 3 and factor 4 were 0.833, 0.833, 0.792 and 0.707 respectively. The reliability coefficient of each sub-dimension is above 0.7, indicating that the internal consistency of the questionnaire structure is good, and the measurement results are reliable and have strong explanatory power.

By checking KMO value and Bartlett sphericity test, we can judge whether the data is suitable for factor analysis. The value of KMO ranges from 0 to 1. The larger the KMO value, the stronger the correlation between the variables. In other words, the more factors have in common, the more suitable for factor analysis. In this regard, scholar K AI ser provides a set of commonly used KMO measures. KMO value greater than 0.9: very suitable for factor analysis; KMO value between 0.8 and 0.9 is suitable for factor analysis; KMO value between 0.7 and 0.8: generally suitable for factor analysis; KMO value less than 0.5: not suitable for factor analysis. After testing, the KMO value of the overall scale of this questionnaire is 0.781, which is greater than 0.7, so it is suitable for factor analysis. The significance of Bartlett sphericity test was less than 0.001, which reached the significance level.

Table 1 Questionnaire validity statistical scale

KMO	sampling	appropriateness	scale
0.781			
Bartlett sphericity test		Approximate	chi-square
1676.431			
		Degree of freedom	276
		Significance	
<.001			

3.4 Questionnaire distribution and recovery

On the basis of ensuring regional balance and realistic conditions, the study relies on regional schools to issue electronic questionnaires to high school students using paper questionnaires. The survey time is from November 2023 to December 2023. After the survey, a total of 172 online questionnaires were collected, and 160 valid questionnaires were obtained by eliminating 12 invalid questionnaires filled in randomly, with an effective rate of 93%.

4. Data analysis and key conclusions

4.1Demographic basic information statistics

Of the 160 high school students surveyed, 89 were male and 71 were female. Among these students, 36.88% participated in learning programming, and 63.12% did not learn programming.

Table 2 High school students learn programming statistics

Programming learning experience	frequency	percent
Never learned	100	62.5%

Less than half a year	37	23.2%
Six months to one year	20	12.5%
More than a year	3	1.8%

Table 3 Questionnaire reliability coefficient table

dimensionality	Number of terms	Klonbach (Alpha) coefficient value	Evaluation result
Questionnaire global scale	24	0.861	Good reliability
Factor one	7	0.833	Good reliability
Factor two	5	0.833	Good reliability
Factor three	7	0.792	Good reliability
Factor four	5	0.707	Good reliability

4.2 Analysis on the level of high school students' artificial intelligence educational literacy and the results of each sub-dimension measurement

According to the data of the research survey, the average score of students' artificial intelligence level literacy is 3.64. The overall situation of students is not very ideal and needs to be improved. Among them, the scores of artificial intelligence awareness, artificial intelligence sentiment and ethics are higher than the overall average, indicating that students have a higher level of artificial intelligence awareness, artificial intelligence sentiment and ethics. However, the average value of artificial intelligence knowledge and artificial intelligence ability is lower than the overall level, indicating that students' artificial intelligence knowledge and artificial intelligence ability still need to be strengthened

Table 4 Artificial intelligence educational literacy level measurement scale

	Sample size	Maximum value	Minimum value	Mean value	Standard deviation
Artificial intelligence consciousness	160	1	5	3.68	0.872
Artificial intelligence	160	1	5	3.42	0.902
Artificial intelligence	160	1	5	3.32	0.935
Ai sentiment and ethics	160	1	5	4.15	1.13

4.2.1 Analysis of artificial intelligence consciousness level of high school students

Artificial intelligence awareness means that students can feel the existence of artificial intelligence and realize the convenience that artificial intelligence brings to life. Take the initiative to discover and actively apply artificial intelligence products in life. The survey shows that the majority of students can realize the importance of artificial intelligence and can realize the convenience brought by artificial intelligence. 91.78% of students have a strong learning interest in artificial intelligence products and technologies. 92.5% of students believe that when they encounter artificial intelligence knowledge they do not understand, they will seek answers through other ways. 93.74 students want to understand how artificial intelligence came into being and developed. Students showed a higher awareness of artificial intelligence and a better performance in artificial intelligence affection. This indicates that they have relatively positive cognitive and emotional attitudes towards AI, are able to understand its potential value, and are concerned about the moral and ethical issues of its application.

4.2.2 Analysis of high school students' artificial intelligence knowledge level

Students have the "first perception" of artificial intelligence and know what artificial intelligence is. The survey shows that 47.1% of the students think that they can draw pictures (such as flow charts, story descriptions, etc.) to help them sort out their ideas to solve problems, and 63.16% of the students can try to apply the previous solution to a new situation when they are stuck in a problem. 53.1% For students' problems in daily life, I can list the process of solving them step by step in detail. By holding AI competitions, lectures and other forms, the school stimulates students' interest and enthusiasm in the field of artificial intelligence and improves their enthusiasm for learning.

4.2.3 Analysis of artificial intelligence ability level of high school students

Students can come up with original ideas for a particular problem from different perspectives; Take different strategies to solve the problem Detail the specific steps to solve the problem and use them to solve similar problems. The survey shows that 53.76% of the students understand the elements and content of programming, and only 33.13% of the students can use graphical programming tools. Only 31.88% of the students were able to run the program incorrectly. I was able to make the program run normally through continuous trial and error, modification and debugging. Nearly half of the students have no knowledge of programming, and most of the students are unfamiliar with programming tools and programs. Schools should set up relevant courses and training to improve students' skills and knowledge, hold AI-related projects and competitions, and improve students' abilities and experiences through practical applications.

4.2.4 Analysis of the emotional and ethical level of high school students' artificial intelligence

Correctly view the important value of artificial intelligence in life, and understand its possible negative impact on human life; Understand the human occupations that may be replaced by artificial intelligence, and rationally locate the human-machine role relationship. 93% of

students believe that the use of artificial intelligence should be strictly ethical. 97% of students believe that any use of AI technology to commit crimes must be punished by law. 77% of students are proficient in using learning AI products. It can be found that the vast majority of students have the right values and responsibility. The role positioning of man and machine is fuzzy, and the relationship between man and machine has not been clearly and reasonably positioned.

5. Discussion and enlightenment

For high school students, they show a high level of concern and understanding in the emotional, ethical and conscious aspects of artificial intelligence, which indicates that they have a certain understanding of the deep impact and potential problems of artificial intelligence. However, in terms of specific knowledge and capabilities of artificial intelligence, they still have significant shortcomings. This may be due to the limited curriculum resources on artificial intelligence in the current high school education system and the lack of in-depth learning and practice opportunities. In order to balance this gap between affection and ethics and practical knowledge and ability, education departments and schools can take a series of measures. First, the development and construction of AI-related courses should be strengthened to provide students with more comprehensive and in-depth learning resources. Second, encourage and create opportunities for students to participate in practical AI projects to deepen their understanding and improve their abilities through practice. In addition, a number of targeted training and seminars are carried out to supplement students' knowledge and improve their practical skills. On the whole, high school students' artificial intelligence affection and ethical awareness are worthy of affirmation, but their specific artificial intelligence knowledge and ability need to be improved. Through appropriate courses and practical activities, it is possible to promote the comprehensive development of high school students in the field of artificial intelligence, cultivate their emotional, ethical, knowledge and ability qualities, and make positive contributions to the sustainable development of artificial intelligence in the future.

References:

[1] Zhang Jinbao, Li Kaiyi. China's artificial intelligence reflection on the status of education [J]. Journal of electrochemical education research, 2022 lancet (8) : 21-28. DOI: 10.13811 / j.carol carroll nki. Investigate. 2022.08.003

[2] of the State Council. The State Council on the notice issued by a new generation of artificial intelligence development planning [EB/OL]. (2017-07-20) [2023-12-21]. HTTP: / / https://www.gov.cn/xinwen/2017-07/20/content_5212064.htm

[3] Ministry of Education. The Ministry of Education issued the "Education Informatization 2.0. Plan of action to inform [EB/OL]. (2018-04-13) [2023-12-21]. https://www.gov.cn/zhengce/zhengceku/2018-12/31/content_5443362.htm

[4] General Office of the Ministry of Education. Notice of the General Office of the Ministry of Education on Issuing the Key Points of Education Informatization and Network Security in 2019 [EB/OL].(2019-02-27)[2023-12-21].

https://www.gov.cn/zhengce/zhengceku/2019-10/23/content_5443956.htm

[5] Ministry of Education of the People's Republic of China. The party central committee and the State Council issued the China education modernization 2035 [EB/OL]. (2019-02-23) [2023-12-21]. HTTP: / / https://www.gov.cn/xinwen/2019-02/23/content_5367987.htm

[6] Chen Weiwei. Development of artificial intelligence technology and its application in education from the perspective of Multiple Intelligences [J]. Research of audio-visual Education,2018(07): 12-19. (in Chinese

[7] Zhang Jianping, Zhang Zhanghua. Problems and Countermeasures of Curriculum implementation of Artificial Intelligence in China [J]. China Audio-Visual Education,2008(10):95-98.

[8] Yuan Liping, Chen Chuannan. Education Blueprint in American Artificial Intelligence Strategy: Text Analysis based on three national artificial intelligence strategies [J]. Comparative Education Research, 2019,42(02):9-15.

[9] Hu Wei. How to Realize "Human-machine Coexistence" in American Education [N]. China Education Journal,2019-3-1(5).

[10] LUO Chaomeng. "Programming Education" : a compulsory course for primary and secondary schools in Japan [J]. Teaching and Educating,2018,(05):29-30.

[11]Fredrik Heintz.Three Interviews About K-12 Education in America,Europe,and Singapore[J].KI-Kunstliche Intelligenz,2021,Vol.35(2):233-237.

[12]Gerald Steinbauer.A Differentiated Discussion About Education K-12 [J].Kunstliche intelligenz,2021,Vol.35(2):1-7.

[13] Wang Xiaofei. The White Paper on Artificial Intelligence: A European Path to Excellence and Trust [J]. Science and Technology China,2020,(09):98-101.

[14] KANDLHOFER M,STEINBAUER G, HIRSCHMUGL-G SCH S, HUBER RArtificial intelligence and computer science in education:From kindergarten to university[C]//2016 IEEE Frontiersin Education Conference (FIE) .IEEE, 2016

[15]PonceA.ArtificialIntelligence:AGameChangerfortheWorldofWork[J].SSRNElectronicJournal,2018.

[16]LONG D, MAGERKO B. What is literacy?competencies and design considerations[C], In Proceedings of (he 2020 CHI Conference on Human FactorsinComputing Systems

[17] Xu Yafeng, Peng Xian, Cao Yue et al. Man-machine coordinated several intellectual horizon, teachers of connotation, function and development [J]. Journal of distance education, 2020, 38 (6) : 13-21. DOI: 10.15881 / j.carol carroll nki/g4.2020.06.002 cn33-1304.

[18] Zhou Shaojin, Wang Fan. Logical Thinking in K-12 Artificial Intelligence Education: The Path of students' Intelligence Generation -- On K-12 Artificial Intelligence textbooks [J]. Modern Educational Technology,2019,29(04):12-18.

[19] Liu Xinyi. High school of artificial intelligence course teaching and experiment platform

[D]. Beijing university of posts and telecommunications, 2021. The DOI: 10.26969 /, dc nki. Gbydu. 2021.000326

[20] Hou Hezhong, Wang Yonggu. Discussion on the framework Construction and training mechanism of primary and secondary School students' Intelligent literacy in the era of Artificial Intelligence [J]. Digital Education, 2019,6(06):50-55.

[21] CAI Jieru. The present situation of the artificial intelligence era pupils intelligence literacy research [D]. Shanghai normal university, 2022. The DOI: 10.27312 /, dc nki. Gshsu. 2022.000305.

[22] Peng Shaodong. Definition and Principle mining of Artificial Intelligence Education [J]. China Audio-Visual Education,2021(06):49-59.