Analysis of Policy Applications of Artificial Intelligence in Education

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Abstract: Along with the continuous improvement of data processing and application capabilities, artificial intelligence has gradually penetrated into all areas of human production and life, driving human society into the age of artificial intelligence. At present, AI education is the trend of education innovation and development. The rise of artificial intelligence brings hope for the innovation and development of the education field. As an important pillar for the realization of a new country of science and technology and a strong country of talents, the state pays special attention to the requirements for the transformation of high-quality education by artificial intelligence when formulating policies and plans. The birth of artificial intelligence brings more possibilities for the modernization of education, and plays a solid foundation and promotes innovation in the fields of basic education, higher education and vocational education. The purpose of this paper is to analyze the application of the policy of "Artificial Intelligence + Education" in the field of education. It explains the strategic significance of the rise of AI in education, and explores the necessary means to collaboratively manage the risks of AI in education.This study will rationally analyze the AI educational applications and explore targeted risk avoidance strategies to safeguard the deep integration of AI and education.

Keywords: artificial intelligence, policy analysis, smart education, risk governance

1. Introduction

The emergence of big data, cloud computing, artificial neural networks, and machine learning has enabled engineers to create machines that can simulate human intelligence. Based on these technologies, this research refers to machines that can perceive, recognize, learn, react, and solve problems, known as artificial intelligence (AI) [1]. As a multidisciplinary technology science, AI has penetrated various fields in society in recent years, causing profound changes in economic structure, social life, and work methods. The education industry is keeping up with the development of advanced technology, and the integration of AI and the education industry is a necessary development trend.

In 2017, the State Council of China released the 'Thirteenth Five-Year Plan for the Development of National Education.' This plan advocated for the advancement of smart campuses in schools and

the extensive utilization of internet, big data, artificial intelligence, and virtual reality technologies. The aim was to explore innovative approaches for future education and teaching [2]. Additionally, the State Council issued the 'New Generation of Artificial Intelligence Development Plan,' which emphasized the importance of universities and research institutions engaging in fundamental theoretical research and interdisciplinary exploratory studies on artificial intelligence. The establishment of the discipline of artificial intelligence was highlighted to provide academic support and a theoretical foundation for its application in the field of education [2].

In 2018, the Ministry of Education of China released the 'Higher Education Artificial Intelligence Innovation Action Plan.' This plan aimed to further enhance the use of artificial intelligence in education and foster collaboration between the government and universities in training AI professionals [2]. Additionally, the Ministry of Education issued the 'Education Informational 2.0 Action Plan,' which emphasized the comprehensive integration of artificial intelligence in teaching, management, and other areas. This plan outlined the direction for talent development in the era of AI and provided specific goals for its application in the field of education [2].

In 2019, the Ministry of Education released the 'Key Points of Education Informational and Network Security in 2019.' This document proposed the formulation of the 'China Intelligent Education Development Plan' and the organization of the International Conference on Artificial Intelligence and Education. These initiatives aimed to accelerate the progress of artificial intelligence in the education sector, while also fostering collaboration and knowledge exchange at both domestic and international levels [2].

The U.S. government's "Executive Order to Maintain Leadership in the Field of Artificial Intelligence in the United States" and "Roadmap for American Artificial Intelligence Research in the Next 20 Years" propose to incorporate artificial intelligence technology into teaching plans and curriculum systems, and cultivate artificial intelligence talents through formal and informal education, the establishment of advanced artificial intelligence degree recruitment and retention programs and other measures[3].The British government's "Plans, Capabilities and Aspirations for the Development of Artificial Intelligence in the United Kingdom" and "New Deal for the Artificial Intelligence Industry" propose to attach importance to data science and computer science, improve the digital literacy of the whole people, incorporate artificial intelligence into school curricula, and establish master's and doctoral degrees in artificial intelligence , and provide scholarship support, strengthen industry-university-research cooperation to educate talents, invest in the cultivation of STEM(Science, Technology, Engineering and Mathematics) talents, etc. [3].The Canadian government's "Pan-Canadian Artificial Intelligence Strategy" proposes to allocate funds to the Institute of Advanced Study, and takes large-scale training of researchers and graduates in the direction of artificial intelligence as one of the main goals [3].The Japanese government's "Artificial Intelligence Technology Strategy" and "Artificial Intelligence Strategy 2019" focus on the deployment and implementation of strategies and measures for talents, research and development, and social applications, and put the reform of the artificial intelligence talent training system in an extremely important position, from the entire education system Starting with the reform, a multi-level talent cultivation system consisting of literacy education, applied basic education, and expert talent cultivation should be established [4].

The Ministry of Education has published a number of policy documents in recent years that explain the value and direction of artificial intelligence in the field of education. These policies give policy support and advice for the use of artificial intelligence in education, fostering the integration and development of AI and education. As a result, with artificial intelligence technology's continued growth, its use in the field of education has emerged as a key strategy for raising educational fairness and improving education's effectiveness and quality. Currently, some research has investigated the application of artificial intelligence in the field of education, but the majority of the research focuses

on its application in teaching, with less attention paid to its application in education policy management, assessment, and decision-making. Meanwhile, policy research on artificial intelligence in education is relatively weak globally.

The study primarily focuses on basic education, higher education, and vocational education, examining the existing state and policy challenges of artificial intelligence application at each stage and giving relevant policy recommendations. This research attempts to investigate the policy analysis of artificial intelligence's use in education. It aims to comprehend the current state of artificial intelligence applications in education from a policy viewpoint, identify any issues, and suggest pertinent policy recommendations to support the steady advancement of artificial intelligence in education. This study employs the literature analysis approach, which collects, organizes, and analyzes relevant literature in order to thoroughly investigate themes such as current policy status, existing challenges, and solutions connected to the use of artificial intelligence in education.

2. Analysis of the Policy Application of Artificial Intelligence in Education

2.1. Basic Education

In traditional education, not all schools and students have access to the same technological resources and opportunities. The intervention of artificial intelligence can collaborate with policies aimed at reducing the digital divide, bridging the gap caused by regional resource disparities, and ensuring that all students can benefit equally from AI educational technology. The application of artificial intelligence in basic education includes providing infrastructure support, training teachers and students, and offering financial aid. It is based on information networks, platform foundations, and digital resources, enabling the construction of smart campuses and the development of innovative applications with trustworthy security measures to enhance the sustainable development capacity of education.

The National Smart Education Platform is an example of educational infrastructure supporting the achievement of Sustainable Development Goal 4 which is ensure inclusive and equitable quality education and promote lifelong learning opportunities for all. This platform encompasses features for student learning, teacher instruction, and school management, covering resources for primary and secondary education, vocational education, higher education, and university student employment services. It represents a milestone achievement in implementing the digitalization strategy for education and a concrete manifestation of promoting educational equity and quality improvement [5].

2.2. Higher Education

Focusing on strategic features such as high technology, originality, and organization, artificial intelligence brings about comprehensive transformation in high-quality higher education. Education and technology are the two pillars of promoting a country through science and education, so to adapt to this changing landscape, higher education should fully leverage its pioneering role [6]. The application of artificial intelligence in higher education includes providing teaching and learning support, such as adaptive learning systems and intelligent instructional software. These tools can offer personalized learning resources and feedback based on students' learning needs and progress. Policies should encourage higher education institutions to adopt these AI tools, ensuring their quality and effectiveness while providing training support for teachers and students.

Furthermore, AI has broad potential for research and innovative applications in higher education, including data analysis, predictive modeling, and automation of experiments. Policies can incentivize higher education institutions to strengthen research and development in the AI field by providing support and funding, and encourage collaboration between academia and industry.

2.3. Vocational Education

In the era of artificial intelligence, comprehensive transformations in talent development, learning methods, teacher development, and evaluation models are necessary for achieving high-quality development in vocational education. Due to the lag in educational reform, future vocational education can only achieve sustained and healthy development with the impetus of top-level national strategies. It requires accurate assessment of the development trends in intelligent technologies and the construction of a data-driven and open development pattern [7].

Artificial intelligence can contribute to vocational education in the following ways:

Occupational Needs Analysis: AI technology can be used to conduct occupational demand analysis for vocational training institutions. By analyzing labor market data and trends, AI can help identify which occupational fields have great demand potential and the specific skills and knowledge required. This assists vocational training institutions in adjusting their courses and training programs to meet labor market demands.

Skill Assessment and Certification: AI can be utilized to assess students' vocational skills and knowledge levels and provide corresponding certification. Policies can mandate the use of AI assessment tools to accurately and objectively evaluate students' skills, ensuring the assessment results are credible and industry-recognized. By embracing AI's capabilities, vocational education can adapt more effectively to the changing needs of industries and the job market, promoting better alignment between skills training and employment opportunities. Policymakers play a crucial role in driving these transformations and ensuring that vocational education remains relevant and responsive in the age of artificial intelligence.

2.4. Shortcomings and Issues of Policies

The rapid development and evolution of AI technology make it difficult for policymakers to keep up with its pace. Policy-making often lags behind technological advancements, making it challenging to address emerging issues and challenges in a timely manner. Additionally, the uncertainty and unpredictability of technology make it harder to formulate long-term effective policies. The application of AI technology extends beyond the tech sector and encompasses various fields, such as education, healthcare, transportation, finance, etc. This complexity requires policymakers to consider the unique needs and impacts of different domains, making it difficult to predict the future direction and speed of technological developments.

AI, with its multiple implications, attempts to explore the mysteries of the educational world and highlights more "enjoyment" and "personalization" [8]. However, AI's application may also bring negative impacts and risks, including employment changes, privacy infringements, and ethical conflicts. For instance, the introduction of AI and automation technology may replace certain job positions in certain industries, increasing the risk of unemployment. Moreover, for individuals and businesses affected by AI applications, the cost of transformation can be substantial. Policy-making often lacks comprehensive assessments and management mechanisms to mitigate potential negative impacts and protect the public interest.

Educators using algorithms in education should adhere to a "people-oriented" governance consciousness, firmly rooted in the original purpose of education. They should have an in-depth understanding of the "rules of the game" in the algorithm world, break free from the constraints and control brought by algorithms, maintain their advantages as educators, and combine their educational wisdom with artificial intelligence to achieve a harmonious coexistence in education [9].

3. Suggestions

Artificial intelligence is an important driving force of the new round of scientific and industrial revolutions, and an important means of improving the quality and efficiency of education. The Chinese government has announced the "New Generation Artificial Intelligence Development Plan", clarifying the importance of AI in economic development, improving life, and international competition, and setting the goal of using intelligent technology to accelerate the reform of talent training and education methods, and to build a new education system that includes intelligent learning and interactive learning [10].

3.1. Ethical Problem

Policy makers should ensure fair, inclusive and ethical application policies for AI.

Policy makers enact data protection laws to enable teachers, students and parents to see, track and review the process of collecting and analyzing educational data. Follow international guidelines developed by expert groups on broader AI data issues [11].

For example, the UK General Data Protection Regulation, which will apply to all EU Member States from 25 May 2018, harmonizes data privacy laws across Europe [10].

Policy makers should foster open discussion about AI ethics, data privacy and security issues, as well as concerns about AI's negative impact on human rights and gender equality.

Policy makers should set and monitor measurable goals to ensure inclusiveness, diversity and equity in the education and development of AI services: identify those who would benefit from AI implementation activities, and strengthen appropriate infrastructure such as internet access, hardware and software to ensure equitable access to the benefits of educational AI. Strategies for reaching out to vulnerable groups; focus on proven AI in education that encompasses students with diverse backgrounds and abilities.

3.2. Technological Uncertainty and Unpredictability

Governments should mobilize cross-sectoral and multi-stakeholder expertise to inform policy-making and build the capacity of policy-makers. Provide policy-makers and education managers with the knowledge and confidence to understand and make decisions about the increasingly rich AI education ecosystem: Provide ongoing training opportunities for policy-makers (including financial planners, policy makers and policy implementation managers); Facilitate training of national and international stakeholders. Provide ongoing training opportunities for decision makers, including financial planners and policy implementers; facilitate the exchange of expertise and best practices among national and international stakeholders; and guide stakeholders to fully understand the educational challenges to be addressed using AI technology.

Governments should bring together cross-sectoral, interdisciplinary and multi-stakeholder expertise to inform key decisions in policy making. Bringing together the expertise of different research communities (neuroscience, cognitive science, social psychology, humanities educators, learning field scientists, AI engineers, etc.) to design user-centric and outcome-based AI techniques to meet real-world classroom needs. In addition, international organizations will work to provide information and advice on AI decision-making. Consider the development potential of AI and improve decision-making efficiency by combining and analyzing multiple data sources. Examples include the European AI Alliance's Senior Expert Group on Artificial Intelligence [11].

Policy makers should establish an open and iterative cycle that includes key steps in planning, implementing, monitoring and updating policies. Such steps should form a continuous learning process. Monitoring and research should be integrated into the overall plan, focusing on specific outcomes and benefits in terms of skills, knowledge and values. Monitoring and research must be

strategically communicated and communicated to policy makers to feed back into a valid and credible evidence base for development. The policy implementation process should allow for review and revision.

3.3. Fairness

Policy makers should encourage localization and reuse of open source AI and incubate indigenous development. As many AI technologies are proprietary intellectual property, it is more important to build specialized open source AI tools and platforms based on specific countries and cultural contexts. Adopting an open source strategy to share data and algorithms fosters national innovation capacity and reduces digital divides between countries and within learner communities.

Governments need to attract and fund corporate investment and build evidence banks. To incentivize and support the development of human-centered AI educational tools, and to bring together learners, funders, commercial developers, educators, and scientists in the learning field to address market failures, the complexities of global educational practices, and the challenges of scaling up programs for initiatives. The IBM Africa Research Lab, for example, is a successful practice [12].

Governments need to drive innovation and incubate the indigenous development of AI technologies and tools: align expertise, resources and capabilities, and leverage empirical research methods in enterprise AI design. Conduct independent assessments of consumer-targeted AI and encourage a consistent "human-centered" approach to future AI. Invest in the education and training of local talent and encourage attempts to build a local AI startup ecosystem within an investment network that reaches the labor and consumer markets. Engage in international collaborations to build resources and capabilities for large-scale deployment of AI technologies, and develop locally rooted AI tools and expertise.

3.4. Intelligent Application Change

Governments should test and scale evidence-based pathways for applying AI to learning. In line with educational priorities, instead of taking a novelty or hype approach, there are technologies such as AI-enhanced individualized learning models, conversation-based guided learning systems, exploratory learning systems, automated essay scoring systems, language learning tools, AI-based artwork and music generation tools, augmented and virtual reality tools, and learning network coordinators that encourage pilot testing and evidence-based adoption such as chatbots. Examples include ITalk2Learn [13], which is a three-year European collaborative project (November 2012 - October 2015) to develop an open-source intelligent guidance platform for students' learning between the ages of 5 and 11 years old.; SmartMusic [14], a web-based music education tool suite that supports music learners' practice and growth; Develop broadly mobilizable competencies such as social-emotional skills, meta-cognition, collaboration, problem-solving and creativity. Ensure that the use of AI in education is strategic (i.e., with long-term pedagogical goals) rather than short-term or ad hoc.

4. The Outlook

The Fourth Industrial Revolution is impacting many aspects of modern life, especially the labor market. In many countries, AI is already taking over standardized and repetitive tasks, revolutionizing efficiency and replacing many jobs. However, according to some of the world's leading consulting firms, AI is also likely to create many new jobs and have a positive overall economic impact, although they disagree on how many jobs will be displaced and how many will be created.

Whatever the long-term outcome, the nature of employment is likely to change [15] and millions of workers will be significantly and often negatively affected. Many will need to retrain; multiple

jobs over a lifetime will quickly become the new normal. At the same time, the skills gap between those who can use new technologies and those who cannot widen, leading to more workers being excluded from the market. Opportunities and risks go hand in hand, and a concerted effort is needed to determine how everyone can benefit from development. The International Labor Organization's recent report, Working for a Better Future: Global Commission on the Future of Work [16], states that people have countless opportunities to improve the quality of working lives, expand choices, close the gender gap, reverse the damage caused by global inequality, and so on. But this will not happen by itself. Without decisive action, humanity will enter a world in which inequality and insecurity will be exacerbated.

Indeed, if countries are to ensure that AI does not exacerbate existing inequalities, it will be increasingly important that every citizen has the opportunity to gain a deep understanding of AI - what it is, how it works, and how it will affect their lives. Teachers will therefore have a key role to play, and educational provision must shift to support lifelong learning so that people can build their agency, employability and ability to contribute to society. In other words, education and training approaches around the world will require a system-wide response to prepare all citizens to live and work harmoniously in the age of artificial intelligence.

5.   Conclusion

This study investigated the policy implications of the use of artificial intelligence in education through a review of the literature. The study discovered that in the fields of basic education, higher education, and vocational education, the use of artificial intelligence has gradually permeated into curriculum design, teaching management, learning assessment, vocational skills training, and other aspects, which can improve education efficiency and quality. This is because artificial intelligence technology is efficient, intelligent, and adaptable.

However, there are also policy issues, such as ethical conflicts, intelligent technology standards, educational equity, data security, and employment changes, which require corresponding regulations and norms. The application of artificial intelligence in the education field brings new opportunities and challenges. Policymakers should strengthen the regulation and norms of artificial intelligence in education, promote the integration of artificial intelligence technology and education, and enhance education equity and quality.

This study proposes the following recommendations: Firstly, the training of artificial intelligence technology for teachers and students should be strengthened, and the interoperability of different application platforms should be promoted to improve artificial intelligence application technology and promote the intelligent social development of education and artificial intelligence, better-facing employment changes and other issues.

Secondly, data security and privacy protection should be strengthened, and relevant policies and laws for the application of artificial intelligence should be established to achieve fair application of artificial intelligence technology in education and avoid ethical conflicts. In addition, this study fills the gap in policy research on the application of artificial intelligence in the field of education, provides relevant policy recommendations, and provides references for policymakers, which is beneficial to promote the stable development of artificial intelligence in education and improve education quality and equity. However, as the study mainly used literature analysis, the research conclusion may have certain subjectivity and limitations. Further empirical research should be conducted in combination with actual situations, and various research methods, such as questionnaire surveys and empirical research, should be used to further explore the policy issues of the application of artificial intelligence in the field of education.

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