AI in Education: Bridging the Divide or Widening the Gap? Exploring Equity, Opportunities, and Challenges in the Digital Age

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Abstract. Artificial Intelligence (AI) stands as a pivotal technological advancement with profound societal implications. This paper delves into a comprehensive analysis of diverse articles and perspectives to scrutinize AI's influence on educational inequality, particularly within the context of the Chinese education system. While prevailing literature often skims the surface, there's a burgeoning sentiment celebrating the human-AI synergy, often overlooking its potential to accentuate educational disparities. This research delves deeper, uncovering the intricate nexus between AI-driven education and human capital markets. The findings suggest that AI, while promising, might inadvertently perpetuate the same crises across different demographics, amplifying existing inequalities. The strong may become stronger, while the vulnerable risk further marginalization, primarily due to disparities in resource allocation. To mitigate these challenges, this paper proposes three actionable recommendations. Furthermore, recognizing the global implications of this issue, the study advocates for international collaboration to ensure equitable access to AI-related educational resources, championing the cause of educational fairness worldwide.

Keywords: Artificial Intelligence (AI); Educational Inequality; Chinese Education System.

In today's rapidly evolving technological landscape, the integration of artificial intelligence (AI) into various sectors has become a focal point of discussion and innovation. As we stand on the brink of an educational revolution, the potential of AI to reshape the way we teach and learn is undeniable. However, with great potential comes great responsibility. While AI promises to bring about transformative changes in the realm of education, it also raises pertinent questions about equity, access, and the implications for students from diverse backgrounds. As we delve deeper into the role of AI in education, it is crucial to examine whether this technological advancement will bridge the educational divide or exacerbate existing inequalities.

Building on the premise of AI's transformative potential, its application in the education sector is rapidly gaining traction. The technology is emerging as an invaluable asset, acting as an intelligent tutor that can meticulously monitor students' progress. By analyzing their learning trajectory in real-time, AI can make informed decisions, ensuring that students receive optimal assistance tailored to their needs (Zhang & Aslan, 2021). One of the primary advantages of AI lies in its capability to present knowledge in a manner that resonates with students, enabling them to grasp complex concepts with greater clarity and efficacy. For instance, 5th and 6th graders have been observed to benefit immensely from AI-driven guidance in learning new science topics, with tools that help them create concept maps and streamline instruction (Chin et al., 2010). Further illustrating AI's transformative impact, studies have highlighted the success of AI-powered simulations in historical education. When students were immersed in virtual historical cities, their comprehension levels soared, and feedback indicated an overwhelmingly positive learning experience (Virtual Worlds vs Books and Videos in History Education: Interactive Learning Environments: Vol 25, No 7, n.d.). This underscores the fact that AI, when used as an innovative knowledge delivery tool, can captivate students' interests and simplify intricate topics, thereby enhancing their overall learning experience. Beyond content delivery, AI plays a pivotal role in fostering a more dynamic student-teacher relationship. It equips educators with invaluable insights into their students. For example, AI systems that discern learners' emotions arm teachers with a deeper understanding of their students' motivations, learning objectives, and emotional states (Leony et al., 2013). Furthermore, teaching agents, powered by AI, offer personalized feedback, enhancing each student's learning journey (Gulz et al., 2020). These systems...
employ sophisticated AI algorithms to forecast students' learning trajectories and performance. Such predictions enable educators to fine-tune their teaching strategies, promptly address potential student challenges, and consequently elevate their overall learning outcomes. A case in point is the AI-driven analysis of students' reading materials, classroom dynamics, and reading strategies. This analysis aids in distinguishing high-performing students from their peers, facilitating the swift allocation of differentiated learning plans (Xiao & Hu, 2019). In essence, AI's involvement ensures a more tailored and efficient educational experience for all.

As AI continues to reshape the educational landscape, it inadvertently shines a spotlight on the disparities that exist within the system. While the numerous research highlighted the advancements AI brings to the table, it's crucial to delve into its implications for equity in education.

The ripple effects of AI's integration into education have intensified discussions around educational disparities. Prominent figures from diverse sectors have expressed optimism about AI's potential to bridge these gaps. Bill Gates, for instance, highlighted a concerning trend in the U.S. where low-income students consistently underperform in math. However, he believes that AI holds the promise to reverse this trajectory (Gates, n.d.). Echoing this sentiment, General Secretary Xi Jinping emphasized the importance of melding AI with education to foster innovation and harness its benefits at the International Conference on Artificial Intelligence and Education (On Artificial Intelligence, the General Secretary Emphasized This!, n.d.).

China, recognizing the transformative power of AI, has embarked on ambitious initiatives to leverage it for educational equity. A report by China’s People Daily detailed the Chinese Ministry of Education’s vision for a new era of smart education. This vision encompasses reforms that ensure equitable access to education across all regions. With AI’s assistance, the goal is to enhance teaching quality, enrich learning experiences, and democratize access to top-tier educational resources (Artificial Intelligence for Transformative Innovation in Education - Government Portal of the Ministry of Education of the People’s Republic of China, n.d.). In line with this, joint efforts by the State Council and the Ministry of Education aim to channel superior educational resources to remote areas, underscoring the nation’s commitment to leveraging AI for educational innovation.

However, the real testament to AI's potential in bridging educational disparities comes from on-ground implementations. Researcher Wang Yao's study sheds light on how AI has been a game-changer for rural education. Historically, rural regions, owing to their economic constraints, struggled to attract quality educators. But with AI's intervention, there's been a marked improvement in both the quality and quantity of educational resources available to these areas (Yao, 2020). This sentiment is further echoed by Mr. Yu Minhong, chairman of New Oriental Education Technology Group. Through his research on English education in rural primary schools, he identified a glaring shortage of teachers. To address this, he championed the use of AI-driven teaching methods, ensuring that rural students receive systematic English education, thereby elevating the quality and efficiency of their learning experience (Yu Minhong Member: The Use of Artificial Intelligence to Narrow the Gap between Urban and Rural education_Surge Number - Media_Surge News - The Paper, n.d.).

With such drastic changes in AI, there are those who remain negative about such a situation. Brynjolfsson, director of the Stanford Digital Economy Lab, says that AI's so easy automation is a trap for humans, and he believes that AI is now just replacing workers instead of expanding human capabilities, because such automation replaces most of the jobs, it leads to economic inequality (Brynjolfsson, n.d.). Daron Acemoglu, an economist at the Massachusetts Institute of Technology, is concerned that the automation of AI has made wages uneven lights, and his data suggests that 50 to 70 percent of the growth in US wage inequality between 1980 and 2016 was caused by automation (Acemoglu & Autor, 2011).

However, this efficient and successful outcome of helping education can further lead to inequality of resources between districts. As a result of the widespread use of AI in education, districts that can use AI are the first to receive an efficient education, while other districts that do not use AI promptly and districts that are in a position to do so create inequality in educational resources. Because of the different economic disparities in technology and technology exposure is different, for those regions
that are not technologically advanced, exposure is to need a lot of money and time to make up for the gap; this problem is related to the previous inequality in education and now want to go to is to use artificial intelligence to make up for the gap if you do not first solve this problem but also exacerbate the inequality in education (Holstein & Doroudi, 2021).

Furthermore, the development of artificial intelligence will lead to the substitution of jobs in different regions, meaning that most of the jobs in the economically and educationally underdeveloped regions at the bottom of the ladder will be replaced by artificial intelligence, leading to a further increase in educational and social inequality (Fang Kecheng: Is Digital Technology Exacerbating Social Inequality? - Issue 5 - HSBC Finance Institute, Peking University, n.d.). Although the development of artificial intelligence is promising, and many things can help human beings to further develop at a higher level, the same development will further open the gap between the higher and lower levels of society.

For the current situation, education is closely related to people's employment, and due to some of the creativity of AI, the market impact on human capital is huge. There is a proportional relationship between the degree of automation in production and the unemployment rate: the more automated the production, the higher the unemployment rate (Sima et al., 2020). For AI, it is possible to replace modular jobs and even self-evaluate for complete autonomy. This puts enormous pressure on many companies to transform, a situation that has far-reaching consequences for society, so it is necessary to significantly limit the development of AI, or change the way of teaching (Tschang & Almirall, 2021).

Therefore, education should make changes to adapt to AI's challenges, but the ability to adapt in different regions remains different. For China's education, China's education system is mainly centered on the college entrance examination, which can achieve civilian education at a low cost for everyone to cover education. The reason for creating the gaokao was to narrow the gap between urban and rural areas and to provide a fair starting point for people in different situations to have a fair relationship with the exam (Davey et al., 2007). There is no denying that in the early days of China's development, the college entrance exams were very effective, and even though many students were under much stress in this situation, the overall level of education in China has improved dramatically. However, in the current context of AI development, China's college entrance examination system has a significant homogenization problem. China's education system allows each student to repeat to learn knowledge, instill it just so that everyone learns the same thing, and then through a test to judge their future, such a situation so that each student will only learn these things without their qualities, this situation is the manifestation of the homogenization of Chinese students (Cheng, F. F. & Zhou, Y. K., 2013). Due to the highly rigorous nature of the gaokao, it is difficult to break through to it. For students in high school, three years only purpose is to prepare for the gaokao. Students find it difficult to realize the initiative, there is no room for creativity, and the high status of the gaokao forms pressure, resulting in the school of learning going all out to the minimum time and maximum efficiency to instill students with knowledge one of the examples in China is the "small town question doers". They are students in the countryside who have been made to learn how to solve problems, studying every day and night to cope with the future college entrance exams. Although they can get good grades in the college entrance exams in this way, they lack their insights and their horizons, and they have no idea about their future (China Youth Studies, 2021).

It is not difficult to imagine that most students born from such an education, after choosing not to enter university studies, enter highly repetitive jobs and are replaced by AIs because they only know how to cope with exams and have lost their idiosyncratic nature as human beings. The replacement of low-end jobs by AI is inevitable because most low-end jobs are highly repetitive and do not have a diverse workflow. For example, AI's high efficiency and accuracy in the sales industry can help customers get the right help quickly and improve marketing efficiency by speculating on their shopping patterns (Davenport et al., 2020). Because of the low-cost return status quo of using AI, all these repeated things get mentioned gradually. If China does not change the current education, this
gap will get bigger and bigger, not only in education but also in the economic gap, widening education inequality.

Everyone has their views on whether AI will affect education. Some people think that the widespread use of AI can alleviate educational inequality, and others think AI will further promote educational inequality. However, this article thinks their ideas are too limited to the surface. They only discuss the allocation of educational resources and enhance the discussion but ignore the current era of great educational changes. Education must be adapted and adjusted for the AI era. In the AI-enhanced society, the status quo in China will remain unequal because different regions and people have different speeds of acceptance of AI. For disadvantaged families, the high cost of AI makes them unable to enjoy the help. However, the advantages of higher families have nothing to do with resulting in AI's faster development. The weaker the disadvantaged families, the stronger the advantages. So, most people are still happy about AI development. It is a substitute for the labor market widening inequality, and AI is further widening educational inequality.

In the age of rapid technological advancements, the unequal distribution of resources has cast a shadow on the promise of AI. This disparity not only reflects the varying risks faced by different segments of society but also underscores the harsh reality that marginalized groups bear the brunt of these risks without reaping the benefits. Such inequalities can exacerbate vulnerabilities, particularly in the human resources market, where AI-induced changes can lead to widespread unemployment. Optimists argue that this challenge can be transformed into an opportunity by fostering human-machine collaborative roles. It's evident that today's AI systems, despite their sophistication, are not entirely autonomous. They require human oversight, as even the most advanced AI makes mistakes (Zawacki-Richter et al., 2019). This interdependence suggests that the proliferation of AI can indeed pave the way for diverse and novel job opportunities. However, a closer examination reveals that these opportunities predominantly favor those who are adaptable and flexible, leaving the disadvantaged at a further disadvantage. These marginalized individuals, often ensnared within rigid educational frameworks, find it challenging to access these new, dynamic roles.

To address this pressing concern, a holistic approach is needed. Rather than presenting fragmented solutions, it's essential to weave a cohesive narrative that champions inclusivity. The education system must undergo a transformative overhaul, with a particular emphasis on uplifting the disadvantaged in underserved regions. Concurrently, there's an urgent need to champion AI-centric education and training initiatives. Such programs can equip marginalized groups with the skills needed for human-AI collaboration, enhancing their employability. Furthermore, for those already impacted by the AI wave, it's crucial to provide subsidies and address livelihood concerns to ensure societal stability.

The disparities introduced by AI are not confined to individual regions or communities; they manifest on a global scale. The AI technological hegemony of countries like the United States has inadvertently placed developing nations at a disadvantage, unable to harness the benefits of emerging technologies. These dynamic risks perpetuating a cycle where developed nations overshadow their developing counterparts. Considering this, it's imperative to advocate for a more egalitarian approach. While it may be unrealistic to expect nations to open-source their AI technologies, there's a moral obligation to ensure equitable AI-driven educational opportunities. Education, a cornerstone of societal progress, should not be a fortress for the privileged. Instead, it should serve as a beacon of social justice, fostering social mobility, and nurturing collaborative contributions for a brighter, inclusive future.

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