# Education Technology and Education Inequality in China

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## ABSTRACT

In recent years, China's education has developed rapidly, but inequality still exists. In the Chinese context, educational technology and educational inequality are often discussed and studied together. Through literature review, this paper briefly summarizes the advantages and problems that need to be solved in the process of bridging the education gap of educational technology and puts forward the idea of promoting strengths and avoiding weaknesses from micro, meso and macro levels. Finally, it is concluded that using AI and other educational technologies as tools and focusing on learners' own knowledge, ability and literacy is the key to alleviating educational inequality.

**Keywords:** Ed-tech; Education inequality; China

## BACKGROUND

Educational technology plays an increasingly important role in today's world, providing learners with unprecedented opportunities and resources. However, in the popular view and in some research, discussions about educational technology are often associated with educational inequality. The relationship between educational technology and educational inequality has attracted much attention.

The origin of education is very ancient; education is a diverse concept that has been described by many people. In ancient Greece, education is the process of cultivating the quality of citizens and improving the human virtue. Dewey thought that, education is growth is a fostering, a nurturing, a cultivating process [1]. Kilpatrick, describes education as equipping students with better cognitive, emotional, social, and physical skills so that they can better understand and participate in society [2]. UNESCO recognizes that Education is the process of facilitating learning or the acquisition of knowledge, skills, values, beliefs and habits, education is a fundamental human right and the key to peace and sustainable development in the world [3]. In everyday life, the general public's understanding of education is often vague and complex, and it is generally believed that education is a systematic process that only imparts knowledge, skills, values and culture, aimed at helping individuals develop and grow.

With the development of China in recent years, the Chinese government's support for education is gradually increasing. In 2021 and 2022, the financial expenditure of the Ministry of Education for education reached 322.63 billion and 330.34 billion [4,5]. Although in education term, China is building a system with the fastest growth in quality and quantity in the world [6]. Educational inequality remains widespread due to differences in economic conditions, geography, family culture and social expectations, and educational technology.

Educational technology is a relatively new thing, and there are many definitions and explanations for it. The Association of Educational Communication and Technology has published an article arguing that definition of educational technology includes theory and practice of design, production, application, management and evaluation of learning processes and resources [7]. Ahmadigol, took it further educational technology includes a dynamic system of study and moral action with the aim of specifying and providing an interactive environment for learners' activity for their fast, easy, durable education and learning in harmony with their interests and characteristics [8]. In short, educational technology refers to the methods and resources that use technology and tools to enhance, improve, and support the educational process, which is a complex system and process that is far from simple as the educational technology products understood by the public.

In 2022, the Chinese Ministry of Education's expenditure on science and technology application reached 765.7439 million yuan, and expenditure on science and technology conditions and services reached 12.6063 million yuan [5]. Overall, the use of educational technology is an inevitable trend in the development of education, but in the context of China, people's attitudes towards educational technology are still complicated.

Narrowing the gap between the rich and the poor and alleviating the educational divide are important issues in China's development. Therefore, whenever new technologies appear, researchers in China's education sector rethink the relationship between educational technology and educational inequality. Naturally, the hot topic in recent years is "AI+Education".

McCarthy, a computer scientist of the last century, first coined the term "Artificial Intelligence" in 1956 at the Dartmouth Workshop, which is considered the origin of the field of artificial intelligence. He defines artificial intelligence as 'the ability of computers to solve problems that today require human intelligence' [9]. With the rapid development of AI in various fields in recent years, a large number of researches on AI have been carried out in China's education sector. Some researchers believe that AI can enable high-quality development of education, which can greatly alleviate the education gap, while others worry that AI will have risks in terms of education quality and ethics and may exacerbate educational inequality [10,11].

In its opinion, although AI has been able to largely simulate some human capabilities, AI should not be regarded as the final answer to solve the problem, just like the entire educational technology, the status and role of AI and other technologies should not be deified, and the trap of technological determinism should be avoided [12]. How can educational technology be used to make teaching and learning more efficient and high-quality to alleviate the educational divide, is the question we should focus on.

## LITERATURE REVIEW

This paper mainly focuses on the relationship between educational technology and educational inequality. Therefore, in the literature review section, it tries to focus on the literature that discusses the relationship between the two, or the papers that discuss the potential or risk of educational technology as a whole or a certain technology in alleviating inequality. However, this is actually a difficult topic to clarify, because the potential and risks of educational technology and specific educational technology products, such as AI, for education and the potential and risks for education equity, to a large extent overlap.

In Google Scholar, using the keyword 'Educational technology education inequality', in the last five years 44,000 results were obtained. With 'education and information digital inequality' as the keyword 10,800 results were obtained. In China National Knowledge Network (CNKI), 334 results were obtained by "educational technology educational equity", and 545 results were obtained by "educational technology equity". The following table is a brief list of the papers that this paper focuses on.

Previous studies have conducted in-depth research on the relationship between educational technology and educational inequality and believe that educational technology has both risk and potential in the face of educational inequality (Table 1).

**Table 1:** Brief list of literature review.

| Title | Author | Focus |
| --- | --- | --- |
| The digital divide in online education: Inequality in digital readiness of students and schools | Van de Werfhorst, et al. [17] | ICT, Digital education, Digital skills |
| Digital Inequality in Rural and Urban settings: Challenges of Education and Information in South African Youth Context. | Choung, et al. [15] | ICT, Digital gap, education gap, Rural and Urban |
| Can MOOCs reduce global inequality in education? | Pollack [13] | MOOCs, Reinforce inequality, Social and economic context |
| Inequality as higher education goes online | Czerniewicz [19] | High education, Networked learning community, Value-based pedagogy |
| Digital higher education: a divider or bridge builder? Leadership perspectives on edtech in a COVID-19 reality | Laufer, et al. [26] | Learning model pedagogy, Digital divide, Critical use |
| Research on the Application Path of Virtual Reality Technology from the perspective of Basic Education Equity | Xiuyu, et al. [21] | Virture reality, Education resources, Basic education, Teaching mode |
| Information technology to promote education fair way and strategy research | Hu [20] | Equality of opportunity |
| Information technology research on the influence of the western high school education fair | Chaojun [18] | External factors, Resource utilization rate, Digital usage divide |
| Educational Application Based on Artificial Intelligence and its Significance for Educational Equity in China | Yichen [22] | K-12 education, AI, Resource sharing |
| Value of Artificial Intelligence to promote education Equity in Qinghai | Zhilei [23] | AI, Integration and sharing of high-quality resources, individuation |

In terms of research on risk Ichou PR. argued that MOOC, for example, although considered unprecedented, and crossing divisions of race, class, age, gender, and geography. Yet empirical studies have demonstrated that students of MOOCs are primarily those already advantaged in terms of education and socioeconomic status [13]. Therefore, he believed that if MOOCs or other Education technologies can't be able to reach and retain those most lacking education, then it will do little to narrow the education gap and may even lead to the Matthew effect [14].

Choung et al., argue that for educational inequality, especially between rural and urban areas, the main reason is the lack of Information and Communications Technologies (ICTs) [15]. Although its research background and object is rural young people in South Africa, it has some similarities with the urban-rural dual structure in China. In China, not all households have equal access to ICT-related equipment and resources.

Despite China's efforts to narrow the gap between urban and rural areas, there are still complex inequalities in education between urban and rural China. Zhou, et al. and some other researchers believe that ICT has a positive impact on promoting educational equity. However, the affordability of information technology widens the gap between users in information access and reduces the versatility and availability of educational resources. Thus, educational technology, while narrowing the rural-urban gap on the one hand, may exacerbate inequality on the other [16].

Similar to these views, Van De Werfhorst, et al. think that an important driver for a digital divides are the ICT skills students have, which are strongly related to students' socioeconomic background. Making ICT equipment and resources available to all learners will not change the status quo if the skills are lacking [17]. Chaojun, also believes that, due to external factors, even providing equal technical resources to all people may exacerbate educational inequality due to the huge difference in application [18].

Therefore, Czerniewicz maintained that it is an undeniable fact that the problem of educational inequality exists widely, and one of the important reasons is the mismatch of pedagogy. He believes the question is how to optimize values-based pedagogically shaped learning in an austerity environment [19].

In terms of research on potential, Hu, focuses on the equality of opportunities. Due to the restrictions of social development in China, educational resources and development opportunities are always limited. She believes that educational technology can enable learners to have equal access to school, learning opportunities and participation opportunities under different conditions [20].

Xiuyu, et al., studied the effect of virtual reality on educational inequality and believed that virtual reality could provide rich teaching and learning resources for basic education in underdeveloped areas and had great potential in improving and enriching single teaching mode [21].

In addition to virtual reality, Artificial Intelligence (AI) is also the focus of many education researchers in China. Yichen, believes that good teachers and educational resources are always limited, and AI can replace teachers to a certain extent. Moreover, with the integration of a large number of databases, the application of AI in K-12 education is the only solution, allowing learners under different conditions to share high-quality educational resources fairly [22].

Zhilei, believes that artificial intelligence can help accelerate the integration and sharing of high-quality education resources, contribute to the continuous advancement of the construction of teachers, effectively promote the reform and innovation of teaching paradigms, and realize personalized education and teaching management [23].

To sum up, concerns about the risks of educational technology in bridging the educational divide are not primarily about the technology itself, but about the related concerns about access to technology and resources, the ability to handle and apply technology and resources, and pedagogical and nurturing objectives, which may lead to poor teaching and learning outcomes and even exacerbate inequality.

In terms of potential, educators mainly focus on the fact that technology can span time and distance, making it easier to obtain resources, that technology products such as AI and VR can make up for the lack of teachers and educational resources, and that

technology can promote the development of students' personality in the environment of large-class teaching in China.

Overall, educators and researchers are critically positive about the role of educational technology in associating the educational divide. This is easy to understand, because we should hold a critical understanding of technology, as Postman, proposed in the article, all technological change is a trade-off. Technology give and technology take away. This means that for every advantage a new technology offers, there is always a corresponding disadvantage. The disadvantage may exceed in importance the advantage, or the advantage may well be worth the cost [24]. Therefore, in the context of China, the application of educational technology to bridge the educational gap should not focus on the issue of support or opposition but should pay more attention to how to promote the advantages and avoid the disadvantages when combining educational technology with teaching and learning in different situations.

## Suggestions for solutions

In the process of connecting the educational gap, educational technology is influenced by many external factors, and multi-interest groups are involved from educational technology products to educational technology policies. Therefore, considering how to exploit the advantages of technology and avoid the disadvantages in the process of connecting the educational gap, can be considered from the perspective of Selwyn's background framework (Figure 1).
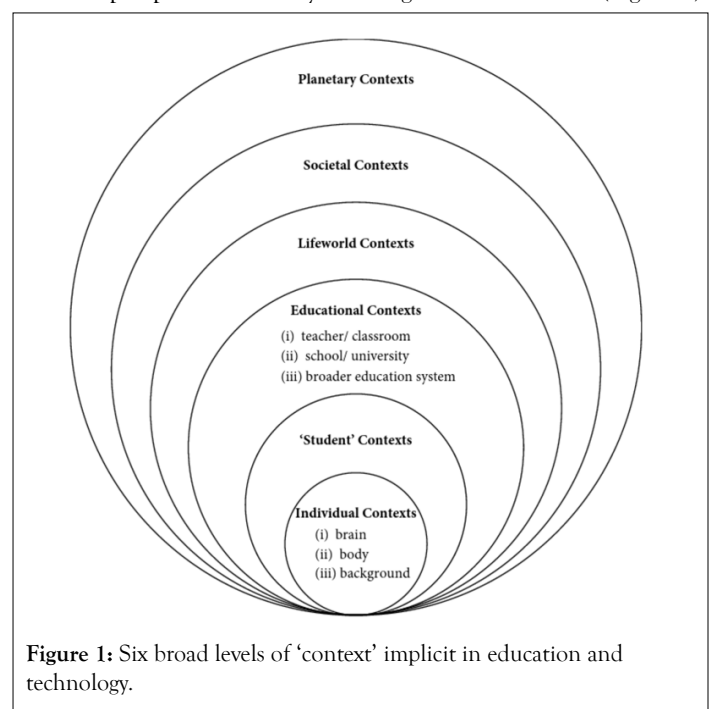


**Figure 1:** Six broad levels of 'context' implicit in education and technology.

Selwyn believes that there are six broad layers of "context" implicit in education and technology, which can be divided into three levels, namely Micro: Individual students and teachers.

**Meso:** Organisational structures and goals of educational institutions.

**Macro:** Broader cultural, social, political and economic values [25].

**Micro:** From the micro level, due to the popularization of the Internet and electronic devices, the ways and processes of learners to obtain learning resources have become more diversified. The Internet opening participation in the knowledge society by decentralizing and democratizing information [26]. Therefore,

learners in less developed areas should make use of educational technologies such as the Internet to obtain educational resources of the same quality as those in developed areas. Through the Internet, learners should find useful information and resources for themselves, complete the transformation of technology is only electronic equipment to the concept of technology is a learning tool, and perceive the effectiveness of educational technology in learning. In this way, learners can overcome the difficulties in using educational technology, improve their acceptance and utilization of educational technology, and promote a virtuous cycle of effective learning [27].

Generally speaking, there are some inadequacies in school education in less developed areas. Therefore, learners should make use of educational technology and learn to learn independently to make up for their own inadequacies in learning. Independent learning theory emphasizes the initiative, autonomy and self-management ability of individual learners in the learning process [28]. When learners consciously use educational technology to conduct independent learning, they will not only acquire knowledge, but also improve their adaptability and self-development ability, laying the foundation for long-term learning and even lifelong learning [29].

At the same time, if you use the latest hot technology to assist learning, such as AI. AI can provide an intelligent, personal tutor for every learner can provide intelligent support for collaborative learning and so on [30]. This emerging educational technology will help students to be no different from learners in developed regions in terms of personalization and creativity. However, learners and teachers should realize that no matter how advanced educational technology such as AI is, AI is not omnipotent and cannot directly solve educational problems. They should avoid falling into the trap of technological determinism, and the quality of learning is not determined by technology [12].

Related to this is what researchers call the secondary digital divide (also digital literacy or digital competency) it can help learners achieve positive learning outcomes in digital settings but also differ based on level of education, culture, English skills and so on [31,32]. However, learners in less developed areas are at a disadvantage in these aspects which may lead to the aggravation of educational inequality. To deal with this problem, we should start with teachers and instructional design.

Teaching methods can be used to make up for the lack of technology and cultivate students' thinking and ability. For example, CS Unplugged Design for Courses, this introduces learners to non-specialized computer science through hands-on activities that do not require the use of computers [33]. Although the researchers believe that this approach is mainly aimed at children in the early grades of computer science introduction strategy, but in the less educated areas of China, this approach has some effect. It allows learners to train their initial computational thinking skills through low-cost means such as cards, Hannot Tower and so on.

At the same time, the traditional Chinese classroom is teacher-oriented lecture class, to enable students to make better use of educational technology and improve learning results. Teachers in less developed areas should innovate their teaching ideas and try flipped classroom and task-driven teaching strategies. Before class, learners learn knowledge content through the Internet, and in class, they focus on student communication, teacher's questions and feedback. This breaks away from the traditional teacher-centric approach in favour of a student-centric approach. Studies have shown that in secondary and higher education, flipped classrooms not only benefit students' academic performance, but also excel in learning motivation, self-efficacy, cooperation, and engagement [34]. By cultivating these abilities, learners in less developed areas can quickly connecting with others in advanced technology in their subsequent study and work. In this process of education, technology, especially ICT, and innovative teaching by teachers are indispensable.

**Meso:** At the meso-level, Organisational structures and goals of educational institutions promote or hinder the connecting of the educational gap. First of all in the campus infrastructure to ensure the improvement of network and information communication equipment. This is an important step towards connecting the digital access divide. According to the statistics of relevant departments, by 2022, China's Internet penetration rate will reach 75.6%, of which 28.9 percent will be rural Internet users and only 61.9 percent will be rural Internet users [35]. This shows that not all learners in less developed areas have access to discretionary electronic devices and have access to educational technology only at school. Therefore, the integration of education technology infrastructure and services in schools emerges as a compensatory measure for the social inequalities of students and may contribute to the reduction of education digital inequality [36].

Secondly, the teaching and learning goal of the school should be designed according to the current situation and development of educational technology. With the rapid development of technology, the society's demand for students' knowledge and ability is also different from the past. Most of the traditional Chinese classrooms, which mainly focus on exam-oriented education, are not adapted to the needs of work and society for learners' ability and quality. During the COVID-19 pandemic, information literacy and ICT skills are important factors affecting work and learning efficiency, so to extend the benefits of digital technologies to more people, it is important that schools focus on improving students' digital skills and information literacy [17].

In the process of achieving this educational goal, the use of technology is essential. Some studies believe that technological products such as AI are opportunities for the revitalization of education in less developed areas [37]. However, in addition to the lack of technology at the physical level, the limiting factors of AI-enabled education in underdeveloped areas are more resistance at the teacher's concept level, insufficient digital skills and information literacy at the ability level, and more restrictions at the level of the traditional school system [38].

The differences in teachers' use of information technology and the resulting differences in teaching thinking are an important manifestation of the 'digital divide' [39]. The digital environment and literacy, teaching effectiveness and teacher resilience of teachers in less developed areas are significantly weaker than those of teachers in technologically developed areas. At the same time, the psychological state of township teachers under stressful situations-"Teacher Resilience" is not as good as that of urban teachers [40].

Therefore, to achieve the above teaching and learning objectives, the training and support of teachers in schools and educational institutions is a necessary condition. Specifically, schools and educational institutions, should clarify the framework of teachers' digital resource utilization literacy, second, can build a dynamic cycle of "evaluation-training" promotion mechanism, and at the same time, should also promote the daily cultivation of teachers'

digital literacy [41].

**Macro:** At the macro level, connecting the education gap mainly depends on government policies and the guidance of social culture and concepts. First of all, the economy needs to be developed. Although China is striving to achieve common prosperity, economic and social inequality is inevitable in the process of development. Regional, urban and rural inequalities remain a cause for concern [42]. Therefore, the economic imbalance leads to the lack of educational resources and inequality, which leads to fierce competition and excessive competition, which is also one of the reasons for the formation of China's examination-oriented society. Although the exam-oriented education is effective in raising the lower limit, it will obviously hinder the development of creativity and personality of top students [43].

Therefore, first and foremost, China should develop its economy and its productive forces. At the same time, the government can further optimize and promote the policy of volunteer education for college students and the policy of volunteer education in remote areas. For example, Aid Tibet and Xinjiang to 10,000 teachers Implementation Plan of Volunteer Teaching Plan [44]. Through volunteer teaching, while making up for the lack of high-quality teachers in less developed areas, teachers in less developed areas are trained in technology and information technology and strive to help local teachers optimize the structure of teachers and improve the level of education. In addition, the advantages of educational technology can be utilized to realize the effectiveness of information empowerment [45].

Some research preliminary suggests that the type of education, its quality and the efficiency with which investment in education is allocated all matter for growth [46]. Through voluntary education, improve the quality of education in less developed areas, through high-quality education, cultivate high-quality talents in line with the development of information society, through talents, revitalize the rural economy, so as to achieve a virtuous circle.

Second, Chinese society is full of speculation on educational technology by various stakeholders, such as technology companies. AI, which has been popular for several years, is also very hot in the field of education. Through Google, search for "AI education ads" in Chinese, and the top results are "Alpha Egg, children are finally waiting for their own AI learning assistant", "From blackboard to Chabot: The long-awaited education revolution is finally coming" and so on. There are also research reports that the demand side of China's AI education industry is further released, the penetration rate of intelligent education products continues to increase, and the market size is growing steadily [47]. Such hype information is a lot, showing the popularity of AI education technology, the beneficiaries may not be learners, or may not be just learners, but also include software companies, electronic equipment companies, and media and so on.

In the face of this situation, the government and educational organizations should enhance their credibility in the era of network and mass media, through communication methods such as agenda setting so that the public can obtain more information beyond hype information, such as science popularization of the principles of AI and technical guidance [48].

Thus, learners, teachers and other people can be correctly guided to the understanding and understanding of emerging educational technologies such as AI, so that people can reasonably think,

accept, choose and use educational technologies [49,50].

## CONCLUSION

As mentioned above, the relationship between education, technology, and inequality is difficult to summarize simply, and it is influenced by multiple factors, from micro to macro. There are limits to how much technology can promote equality in education. Educational technology and its duality should be considered reasonably and comprehensively, not only to use educational technology to promote educational equality, but also to avoid the revenge effect of technology.

At the micro level, recognizing the instrumental attributes of educational technology and paying attention to learners' attitudes and abilities, especially their creativity, can help connection the educational gap by improving learners' information literacy and giving full play to the instrumental advantages of technology.

At the meso level, recognizing the potential of emerging educational technologies such as AI, actively adapting and integrating technology, improving teachers' information-based teaching ability, and aiming at cultivating learners who can develop together with technology will help bridge the education gap.

At the macro level, recognizing the causes of the education gap, accelerating economic development, using a number of poverty alleviation policies, promoting the joint development of economic education, causing the public to think correctly about technology, and avoiding the negative impact of excessive hype will help connection the education gap.

To sum up, the core of using educational technology to help connection the education gap is to enhance learners' knowledge, ability and quality through the efforts of individuals, school institutions, governments, society and other aspects, so that learners in different regions and different conditions can maintain equal opportunities in school, school, work and so on. This is not only conducive to the development of individuals, but also necessary for the development of the country and society.

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