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Exploring the Equity of Urban and Rural Education in the Context of Informatization

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Abstract: Education informatization is of great significance in promoting urban-rural education equity and is highly expected by academics and policymakers. However, without proper planning, it may exacerbate disparities instead of bridging them. This study examines how information technology can enhance urban-rural education equity, its impact on education quality, and effective strategies to narrow the gap. Using a mixed-methods approach, the study combines literature review, case studies, and questionnaire surveys targeting educators, students, and parents in regions with significant urban-rural disparities. The results of the study show that the informatization reform has promoted the sharing of educational resources between urban and rural areas to a certain extent, but the actual effect is constrained by a number of factors, and greater efforts are needed in terms of technology popularization, policy support and social resource inputs in order to achieve real equity in urban and rural education.

Keywords: Education equity, urban-rural gap, education informatization

1. Introduction

With the reform of the financial system for basic education and stronger state control over educational resources, the gap between urban and rural compulsory education has gradually narrowed. In the context of informatization, research on urban-rural educational equity focuses on two key aspects: how information technology promotes access to educational resources in rural areas through distance education and online classrooms, and the potential digital divide that may exacerbate educational disparities due to insufficient technological facilities and weak teacher support. While existing studies have explored these issues, more focus on short-term effects, lacking in-depth analysis of long-term impacts on teaching quality, teacher training, and pedagogical reforms. Additionally, systematic theoretical analysis and empirical research on how informatization can truly enhance urban-rural educational equity remain insufficient. To address these gaps, this paper examines the current situation, challenges, and strategies for urban-rural educational equity in the informatization era. Through literature review, case studies, surveys, and interviews with educators, students, and parents, the study evaluates how informatization fosters resource sharing and teaching quality improvement while identifying associated risks. Given the potential of information technology in education, ensuring quality and supervision is crucial; otherwise, it risks becoming an unfulfilled vision. This research provides theoretical support for optimizing information policies and promoting balanced urban-rural education development, contributing to the broader goal of educational modernization.

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2. The current situation of equity in urban and rural education in the context of informatization

Education informatization is an effective means of promoting the sharing of high-quality educational resources and narrowing the urban-rural education gap [1]. Schools, policymakers and educators increasingly rely on information and communication technology (ICT) tools enhance educational equity in various contexts [2]. By leveraging ICT, such as computers and the Internet, education can overcome time and space limitations, fostering balanced development in many countries [3]. With advantages like rapid dissemination, broad coverage, and resource sharing, information technology has significantly expanded educational opportunities and accessibility [4].

2.1. Differences in educational resources and informatization levels between urban and rural areas

In recent years, reforms in the financial system for basic education and increased state investment in rural schools have helped narrow the urban-rural gap in compulsory education resources [5]. However, as urbanization and household registration reforms continue, rising student mobility has challenged the existing funding mechanisms. Issues such as inconsistencies in urban-rural funding policies, lack of resource portability, and imbalanced allocation persist, requiring further reforms [6]. Research by Amini and Nivorozhkin on Russian education highlights that wealthier regions invest more in education, leading to disparities in budgets and educational quality [7]. Similarly, in China, rural areas face financial constrains, leading to teacher shortages and declining education quality compared to urban schools. Yan and Wan's study on urban-rural compulsory education integration found a decline in teacher allocation and quality assurance levels after 2019. This may be due to rural student reductions, urban student increases, and disparities in talent policies, creating an "urban-rural inversion" that has drawn government attention [5]. Regarding informatization, China has launched various initiatives since the 1989 *National Education Information System Outline*, including the *Three Passes and Two Platforms and the Full Coverage of Rural Teaching Points with Digital Educational Resources. The Education Informatization 2.0 Action Plan* (2018) aimed to enhance resource allocation through "Internet+Education," fostering digital resource sharing and deeper integration of technology in education [8].

Despite these efforts, challenges remain in rural schools. As of 2023, multimedia classrooms coverage in rural primary and secondary schools was only 78%, compared to over 95% in urban areas. Additionally, rural schools face outdated digital resource libraries, reliance on obsolete materials, and inadequate network infrastructure. In some remote areas, limited bandwidth causes online classroom disruptions, and during the pandemic, students in certain regions had to climb hills to access an internet signal. Addressing these disparities is crucial for achieving true urban-rural educational equity.

2.2. The positive effects of informational education

Information-based education, supported by online platforms, live-streaming, and cloud technologies, has removed traditional barriers of time and space. For example, China's "National Intelligent Education Platform for Primary and Secondary Schools" now reaches over 8 million teachers and 130 million students. This allows students in remote regions like Tibet and Qinghai to access the same high-quality lessons offered in cities like Beijing and Shanghai. Globally, platforms such as Coursera and edX offer flexible learning opportunities to over 140 million users, allowing working professionals to complete programs like MIT's MicroMasters in their spare time. This democratization of education supports equal access regardless of region, age, or profession.

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Technology-driven innovations are also transforming teaching methods. Blended learning at Tsinghua University using the Rain Classroom model has raised course completion rates to 92% and improved knowledge retention by 35% compared to traditional in-person teaching. Meanwhile, digital education significantly reduces the marginal cost of content delivery. For instance, Harvard's CS50 course has reached 2.9 million learners with a per capita cost of less than 1% of traditional teaching. Advancements in Virtual reality (VR) further enhance learning by creating immersive environments. Medical students using VR simulators like Osso VR and Touch Surgery can master laparoscopic procedures 4-9 months faster than through traditional methods [9]. These developments show that informatized education is not just a tool, but a paradigm shift that reshapes how knowledge is acquired and skills are cultivatedm forming the foundation for a lifelong learning society.

However, disparities remain in the implementation of educational technology. The Chinese Ministry of Education's *Education Informatization 2.0 Action Plan* (2018) emphasized narrowing the digital divide by ensuring balanced distribution of resources under "Internet+" conditions. Yet, many rural schools and village-level teaching points still struggle with high staff turnover, limited resources, and inadequate infrastructure. These issues continue to hinder the balanced development of basic education and widen the gap between urban and rural schools.

2.3. Major challenges

2.3.1. Inadequate technical facilities, teachers and educational concepts

Although the Chinese government has increased investment in rural education informatization, significant disparities remain between urban and rural areas in infrastructure and technological support. According to *the Annual Report on the Development of China's Education Informatization* (2023), while 95% of urban schools are equipped with computers, only 62% of rural schools meet this standard. Moreover, network bandwidth and technical support services in rural areas are often inadequate, meaning that even when schools have devices, they cannot fully utilize them for effective teaching. Urban schools also enjoy greater access to high-quality online educational resources. In contrast, slow internet speeds, lack of equipment maintenance, and limited technical assistance hinder rural schools from effectively using these resources, resulting in a "double inequality" in both access and usage.

The disparity in teaching resources further intensifies this imbalance. Despite national initiatives such as the rural teacher placement and support programs, rural schools still suffer from teacher shortages, low teaching quality, and high turnover rates. According to the 2022 China Teacher Development Report, the average annual salary of urban teachers is 80,000 yuan, while rural teachers earn only 50,000 yuan. This wage gap affects the attractiveness and retention of teachers in rural areas. Additionally, urban teachers have more opportunities for professional development and IT training, whereas rural teachers often lack access to continued education and technological instruction. Consequently, many rural educators struggle to integrate digital tools into their teaching.

2.3.2. Bottlenecks in informational education in rural areas

The digital divide remains a core obstacle. According to *the 2019 Statistical Report on China's Internet Development*, internet penetration in rural areas stands at 50.3%, compared to 80.5% in urban areas. This gap limits access to online educational resources and hampers the broader implementation of digital learning. Furthermore, rural schools often lack modern equipment such as smart blackboards, projectors, and personal computers. As per *the China Education Informatization Development Report* (2021), 45% of rural schools have not achieved the target of "one computer per student," which adversely affects students' digital literacy and learning outcomes. Although over 80% of teachers nationwide have undergone IT training (as per *the Education Informatization 2.0 Action*

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Plan), many rural teachers still find it difficult to apply these tools effectively. A recent study shows that 58% of rural teachers feel unable to use IT tools efficiently in the classroom, citing lack of practical training and ongoing support as key barriers.

Lastly, outdated educational philosophies pose further challenges. Many rural schools remain committed to traditional face-to-face teaching and view digital tools with skepticism. Surveys reveal that 45% of rural parents believe IT education has not significantly improved academic performance, and some even question its relevance. This resistance from both educators and parents reflects a broader hesitation to embrace educational modernization in rural communities.

3. Research design

3.1. Questionnaire survey

This study employed a questionnaire survey to examine how educational equity can be achieved through informationization by comparing urban and rural education. Data collection occurred from December 2024 to January 2025, using both online and paper-based formats. Online questionnaires were distributed via platforms such as Questionnaire Star and Tencent Questionnaire, while paper questionnaires were administered through school visits to ensure regional diversity. Ethical standards were strictly followed. All participants received informed consent forms explaining the academic purpose of the study and the confidentiality of their data. No sensitive personal information was collected. A total of 300 questionnaires were distributed, with 285 valid responses collected (a 95% response rate). Respondents included students and teachers from various urban and rural schools, ensuring balanced representation across age, gender, and educational backgrounds.

3.2. Interview method

To gain deeper insights, interviews were conducted with 300 individuals, including teachers, students, and parents from both urban and rural settings. The sample comprised 150 participants from urban schools and 150 from rural schools. Interviewees were selected based on representativeness to explore the impact of informatized education on educational resource distribution, teaching methods, and student learning. This method allowed for a more nuanced understanding of the challenges and opportunities of information technology in promoting urban-rural educational equity.

4. Research results and analysis

4.1. Descriptive statistics results

This study presents descriptive statistics based on 300 valid samples to provide a foundation for analyzing urban-rural educational equity in the context of informatization, shown in Table 1 below.

The gender distribution is relatively balanced, with 51.7% female and 48.3% male respondents. The age group 18-24 accounts for the largest share (40.0%), followed by 25-34 (30.0%) and 35-44 (20.0%), indicating diverse age participation. Urban and rural respondents are evenly distributed (50.0% each), ensuring comparability. Regarding education levels, 50.0% of participants hold a college or bachelor's degree, 36.7% have a high school education or below, and 13.3% have a master's degree or above. These demographic characteristics offer essential baseline data for the following analysis of the impact of informatization on educational equity across different regions.

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Table 1: Basic information of the sample

Characteristics	Classification	Sample size	Proportion (%)
Sex	Male	145	48.3
	Female	155	51.7
Age	18-24 years old	120	40.0
	25-34 years old	90	30.0
	35-44 years old	60	20.0
	45 years old and above	30	10.0
Urban/rural classification	Urban	150	50.0
	Rural	150	50.0
Educational level	High school and below	110	36.7
	College and bachelor degree	150	50.0
	Master's degree and above	40	13.3

4.2. Analysis of key data and results of the questionnaire

The questionnaire survey covered 300 students and teachers in both urban and rural areas, covering topics such as the use of informatized educational resources, the accessibility of teaching tools, and the learning effects of students. The questionnaire was divided into four main sections: accessibility of educational resources, application of information technology in teaching, teachers' and students' knowledge and attitudes towards informatization education, and the impact of informatization education on learning outcomes.

Table 2: Access to educational resources

Access to educational resources	Urban areas (%)	Rural areas (%)
Having a stable internet connection	92	58
Have access to modern educational equipment	89	45
Teachers receive informatization training	85	50

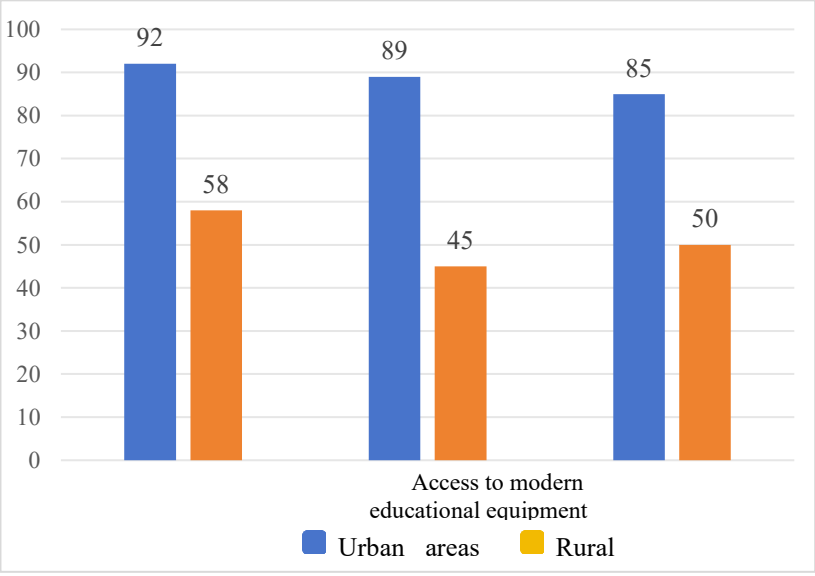

Figure 1: Histogram of access to educational resources

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From Table 2 and Figure 1, it can be seen that educational resources in urban areas are relatively more abundant, with almost all students and teachers having access to stable Internet connections and modern educational equipment, while a large gap exists in rural areas. Only 58% of rural students have stable access to the Internet, and the utilization rate of modern educational equipment is only 45%, which poses a serious challenge to the implementation of information-based education.

Table 3: Effectiveness of the application of information-based education

Influencing Factors	Urban students (%)	Rural students (%)
Informative Education Enhances Interest in Learning	92	68
Informative Education Helps Subject Understanding	88	60
Informative education improves academic performance	81	52

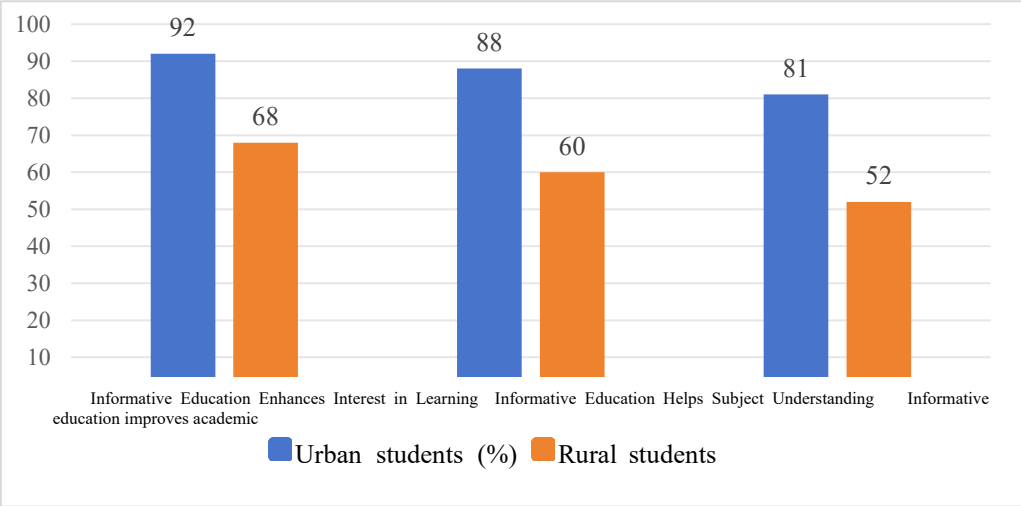

Figure 2: Histogram of the application effect of information technology education

According to Table 3 and Figure 2, it can be seen that students in urban areas are more receptive to information technology education, with 92% of them believing that information technology teaching helps to enhance their interest in learning, while only 68% of rural students share the same view. As for teachers, the level of awareness of urban teachers is significantly higher than that of rural teachers, with 85% of urban teachers indicating that they can skillfully use educational technology tools for teaching, compared with 55% of rural teachers.

An analysis of the above data reveals that there are significant differences between urban and rural areas in terms of access to informatized educational resources, teacher training and students' learning outcomes. These disparities affect the equity of urban and rural education to a certain extent. In urban areas, informatized education is widely used and the digital literacy of teachers and students is generally high, which creates favorable conditions for the improvement of education quality. In rural areas, however, due to constraints in Internet access, educational equipment and teacher training, the effectiveness of informatized education is significantly lower than in urban areas, further exacerbating urban-rural educational inequality.

4.3. Feedback from education practitioners, students and parents

While educators in urban areas can generally use modern educational equipment for teaching, educators in rural areas face the problems of insufficient educational equipment and unstable network connection, and some rural educators have received insufficient training, which results in the use of informatization tools as a formality and failure to be truly integrated into teaching. At the individual

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level, rural teachers have insufficient awareness of digital transformation and insufficient motivation for digital transformation due to the closed educational environment, while urban teachers want to optimize the communication mechanism between home and school to avoid parents' burden on teaching due to over-reliance on online communication.As for students, most urban students have stable Internet connections and adequate Internet devices, while rural areas have low use of informatization tools, limited teaching content, and reliance on traditional modes, leading to significant differences in learning effects between urban and rural areas. As for parents, most urban parents recognize the value of informationalized teaching, but they are also concerned that online teaching and informationalized devices may affect students' health and interfere with their ability to concentrate on their studies, and they ask schools to strengthen the supervision of the use of e-learning devices. Rural parents, on the other hand, have difficulty in tutoring their children because of their low digital literacy and are in urgent need of schools to provide operating guidelines or parent training.

The gap between urban and rural informatization education is not only reflected in hardware resources, but also in teachers' ability, students' experience and parents' feedback, etc. The contradiction between urban and rural dichotomous structure still exists in our country, with a shortage of high-quality educational resources in the countryside, and a mismatch between the allocation of urban educational resources and the development of education informatization.

5. Recommendations for countermeasures

Based on the above research findings, the following countermeasures are proposed to enhance urban-rural educational equity in the context of informatization.

First, optimize policy support and financial investment. It is essential to increase funding for compulsory education and recognize it as the core of the basic public service system. Public services related to social equity and with strong externalities should primarily be supported by the central and provincial governments to reduce regional disparities. The central government should further refine its financial transfer mechanism by combining vertical transfers with horizontal support from local governments, thus encouraging local authorities to increase educational investment and ensuring effective resource redistribution [10]. Second, strengthen rural informatization infrastructure and teacher training. Efforts should focus on targeted improvements in rural schools, with clear short- and long-term development plans. Investments should prioritize infrastructure upgrades, equipment renewal, and human resource development. A sound incentive mechanism should be established to attract and retain high-quality educators in rural areas. In addition, regular training programs must be provided to enhance teachers’ proficiency in digital tools and teaching technologies, enabling them to better integrate informatization into everyday teaching. Third, promote the construction of urban-rural resource-sharing platforms. By leveraging informatization projects and teacher training programs, the government has made progress in improving rural education conditions. Expanding access to high-quality online resources, such as recorded lessons and interactive teaching with urban educators, can help bridge the urban-rural gap. These platforms provide standardized curricula and teaching content, supporting equal educational opportunities. Scholars such as Yu Shengquan emphasize that information technology plays a key role in resource sharing, teaching efficiency, educational quality, and teacher development—making it a vital tool for achieving educational equity [11].

These strategies collectively aim to build a more balanced and inclusive education system through targeted policy, infrastructure, and digital innovation.

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6. Conclusions

Although current research on urban-rural educational equity under informatization has made notable progress, several limitations remain. Many studies primarily focus on short-term outcomes, lacking in-depth exploration of the long-term mechanisms by which informatization influences educational equity. Most empirical work emphasizes infrastructure construction and initial resource sharing, while insufficient attention has been paid to how information technology can drive deeper improvements in education quality, such as teacher training and pedagogical reform. Moreover, while informatized education has helped narrow the urban-rural education gap to some extent, challenges persist. Disparities in technical infrastructure, outdated educational concepts, and a shortage of qualified teachers continue to hinder the full realization of informatization's benefits. The "digital divide" remains a critical issue, and the dual nature of technology—as both an enabler and a barrier—deserves further investigation.

Future research should examine the long-term impacts of informatization on urban-rural education equity and delve into its underlying mechanisms for enhancing teaching quality and reforming instructional methods. Greater focus should be placed on identifying solutions to current obstacles, such as addressing infrastructure deficits in rural areas and improving teachers' digital literacy and instructional capacity. Furthermore, the rise of emerging technologies—including artificial intelligence, big data, and cloud computing—offers new possibilities for promoting educational equity. Future studies may explore how these technologies can support more effective resource sharing and balanced development between urban and rural schools.

In conclusion, while challenges remain, continued technological advancement and policy refinement offer hope for achieving equitable education. Future research should integrate theoretical frameworks with practical application to provide a stronger foundation for informed policy-making and effective educational reform.

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