

Reproduction and breakthrough of the digital divide: a study on the fairness paradox of online education in rural adult education

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Abstract. Based on Pierre Bourdieu's cultural reproduction theory as the analytical framework, this paper examines the "fairness paradox" triggered by online education in the field of rural adult education in China. The study points out that digital technology has not automatically bridged the educational gap; instead, it may collude with the existing social structure through "digital capital"—a new form of cultural capital—to reproduce and reinforce inequality. The paper systematically analyzes three existing realistic paradoxes: "the disconnect between technological inclusiveness and resource adaptability", "the disjunction between facility coverage and usage effectiveness", and "the misalignment between policy promotion and internal motivation", revealing that the digital divide has deepened from the "access" level to the "skills" and "cognitive" levels. To transcend the digital divide, this paper constructs a path combining "adaptive intervention" and "systematic restructuring", advocating the effective accumulation and transformation of rural adults' digital capital through content localization, establishment of community support networks, construction of a multi-stakeholder collaborative governance system, and promotion of competency-based evaluation.

Keywords: digital divide, cultural reproduction, online education, rural adult education, digital capital, educational equity

1. Introduction

The popularization of digital technology in education has not automatically achieved educational equity; on the contrary, it may exacerbate existing social inequalities. Large-scale online learning practices during the COVID-19 pandemic highlighted the profound digital divide between urban and rural areas [1]. Although online education is entrusted with high hopes for promoting educational equity, a "fairness paradox" has emerged in reality: while technology should bridge gaps, it has solidified the original class boundaries under the influence of structural inequality [2]. This paradox presents acute contradictions in the practice of rural adult education with significant resource constraints, requiring theoretical analysis to guide practical breakthroughs.

Based on Pierre Bourdieu's "cultural reproduction theory", this paper explores how digital capital reconstructs and reinforces inequality in the field of rural adult education [3], and attempts to propose practically feasible breakthrough paths to provide theoretical basis and practical reference for promoting educational equity. Different from traditional research on educational inequality, this paper focuses on how the new medium of digital technology interacts with the existing social structure, revealing the complexity and particularity of educational equity issues in the digital economy era.

2. Literature review and theoretical framework

2.1. Evolution of digital divide research: paradigm shift from "access" to empowerment

The concept of the digital divide has evolved from a single access issue into a multi-dimensional and complex spectrum encompassing access, usage, and empowerment. Early research focused on the "first-level digital divide", i.e., the physical "access gap", focusing on differences in the popularization of computer and Internet infrastructure. With the expansion of technology coverage, research attention shifted to the "second-level digital divide", i.e., the "usage gap", exploring differences among groups in terms of Internet usage skills, frequency, diversity, and purposes. In recent years, academic circles have further recognized that the "skills gap" and "cognitive gap" are more critical, as they relate to individuals' ability to effectively use information and convert it into practical benefits [4]. With theoretical evolution, the essence of the digital divide has shifted from a technological issue of "having or not having" to a social capability issue of "being good or bad". These studies provide a theoretical foundation for this paper's analysis of the fairness paradox of online education in rural adult education.

Existing research mainly focuses on basic education and higher education, with insufficient attention to the special field of rural adult education. The rural adult education group has unique economic conditions, cultural backgrounds, and learning needs, and the formation and performance of their digital divide have significant field-specific characteristics. By combining cultural reproduction theory with the concept of digital capital, this paper constructs an analytical framework to reveal the fairness paradox of online education in rural adult education.

2.2. Cultural reproduction theory and digital capital: construction of the analytical framework

Bourdieu's cultural reproduction theory emphasizes that the education system legitimizes and reproduces social class differences through the transmission and transformation of cultural capital. In the digital era, the form of cultural capital has expanded to digital capital, which includes objective digital capital (such as equipment and networks) and embodied digital capital (such as skills and habits). Digital capital has become a new and critical form of cultural capital. It not only includes the "material form" of smart devices and network connections but also the "embodied form" such as operational proficiency, information literacy, and online social skills, as well as the "institutionalized form" such as social networks and support for leveraging digital technology to gain advantages. Research by Gao et al. [5] found that simple technical intervention may become a tool for a new round of cultural reproduction. Firstly, it focuses on the conflict between mainstream cultural capital (urban-centric curriculum content) and rural local cultural capital; if online education fails to achieve effective cultural translation, it will exacerbate this inequality. Secondly, it pays attention to the lack of digital capital among rural adults, who may be unable to effectively use seemingly equal technical tools. Finally, for example, the "habitus" formed by rural learners in long-term educational disadvantages is incompatible with online education, making it difficult for external policy incentives to activate their deep learning identity. Therefore, this theory helps reveal the new mechanisms and challenges of cultural reproduction in the digital era. It shifts the analysis of educational inequality from purely economic factors to more hidden and profound cultural and social processes, providing a key perspective for this study to understand why online education is difficult to break the barriers of rural adult education.

3. Three fairness paradoxes of online education for rural adults in China

3.1. The disconnect between technological inclusiveness and resource adaptability: contradiction between academic thresholds and farmers' educational needs

As a typical practice of online education in rural areas, the "One College Student per Village" Program of the Open University of China requires applicants to have a high school graduation certificate for registration, which directly excludes most farmers. According to the latest data in 2025, the Open University of China has cumulatively trained over 2 million graduates in rural-related majors, among whom 41.7% serve as village committee cadres and 65% start businesses or work in rural areas, forming a talent pattern of "one college student per village and one technical expert per household". However, behind this achievement lies a disconnect in resource adaptability.

There is a significant disconnect between the content of educational resources and the actual needs of rural adults. The learning needs of rural adult education groups are characterized by "valuing practice over theory". Although the state has vigorously promoted resource sinking through the "Digital Countryside" strategy and various online education platforms, many courses still follow urban-centric knowledge systems and teaching models. For example, a large number of general education courses and workplace soft skills training on platforms are seriously inconsistent with the practical knowledge urgently needed by rural adult learners, such as modern agricultural technology, characteristic breeding, agricultural product e-commerce operation, and rural tourism services [6]. This mismatch between supply and demand results in the inclusive access of technological empowerment failing to be effectively converted into perceptible and applicable practical skill increments for farmers, thereby weakening the realization of the instrumental value of online education.

Curriculum design has not fully considered the cognitive characteristics and learning habits of rural adults. Most high-quality online educational resources are developed by universities or urban educational institutions, and their content arrangement, teaching rhythm, and discourse system often presuppose specific educational and cultural backgrounds and knowledge reserves. For rural adult learners with relatively fragmented knowledge structures and weak theoretical learning foundations, there is a high cognitive threshold. They are more adaptable to intuitive, vivid, and case-based teaching combined with specific production scenarios, rather than abstract theoretical elaboration. This "acclimatization" in teaching design directly affects learners' understanding and absorption effects, weakening their confidence in continuous learning. The digital skills, learning habits, and even knowledge discourse systems presupposed by online education platforms are implicitly closer to the dominant class with urban cultural capital, while rural adults are originally relatively weak in the accumulation of family cultural capital, putting them in a dual disadvantage of "innate insufficiency" in the accumulation of digital capital [7]. Existing online education

platforms often take the learning preferences of the urban middle class as the design orientation, providing standardized and theoretical curriculum content, which has a significant gap with the actual needs of rural adult education groups.

The root cause of the disconnect between resource supply and demand lies in the imperfect integration mechanism of production and education. The lack of educational designers who are deeply involved in rural frontlines is the underlying reason for the low adaptability of resources. Curriculum developers often lack a personal understanding of local industrial forms, seasonal agricultural activities, and the real pain points of farmers. An ideal model should be "from the fields to the fields", with educational institutions, local governments, agricultural technology experts, and local "native experts" jointly participating in curriculum development. However, the current effective mechanism for multi-stakeholder collaboration has not been established, leading to the disconnection of educational resource supply from the realities of rural areas and resulting in the idleness and waste of state-invested resources.

Therefore, the above three manifestations of "the disconnect between technological inclusiveness and resource adaptability" make it difficult for online education to truly serve the rural adult education group; instead, it may exacerbate educational inequality due to mismatched content.

3.2. The disjunction between facility coverage and usage effectiveness: gap between physical access and digital skills

The "Village to Village" project has achieved widespread network coverage, but it has not automatically realized "everyone can use" applications. China's achievements in information infrastructure construction are obvious, with optical fiber and 4G/5G signals covering most administrative villages. However, the availability of physical networks is only the starting point for digital participation. For the majority of middle-aged and elderly groups in rural areas, operating smart terminal devices themselves is an insurmountable digital divide. Basic operations such as turning on/off the device, connecting to Wi-Fi, installing and logging in to Apps, and making online payments may pose great challenges to them [8], not to mention proficiently selecting courses, learning, and interacting on educational platforms.

The insufficient digital literacy of rural adults, especially elderly learners, is the core bottleneck restricting the effectiveness of device use. Digital literacy includes not only basic operational skills but also comprehensive abilities such as information identification and network security protection. Due to the lack of systematic training and daily application scenarios, many rural learners feel unfamiliar and distrustful of the digital world. Faced with complex application interfaces and pop-up ads, they are prone to confusion and anxiety, and even resist using smart devices for fear of property losses caused by incorrect operations. This psychological barrier further limits their ability to utilize online educational resources. Against the background of uneven distribution of digital educational resources between urban and rural areas, the weak basic digital literacy (such as touch-screen operation and network cognition) of rural learners, especially rural elderly learners, has become a major obstacle to their participation in online education and independent learning using smart devices.

The current policy support system has a tendency of "valuing hardware over empowerment". Government investment at all levels is more focused on hardware aspects such as network equipment and terminal donations, while support for subsequent and sustained digital skills training is obviously insufficient. Fragmented and campaign-style training cannot meet the needs of the majority of rural residents for systematic improvement of digital literacy. Especially in rural areas with an intensifying aging population trend, how to design simple and easy-to-learn training courses for older learners and establish a team of digital technology assistants rooted in rural areas to convert the "coverage advantage" of infrastructure into the "application advantage" of farmers is a key issue that must be solved to improve the effectiveness of online education use.

3.3. The misalignment between policy promotion and internal motivation

Formalistic tendencies and incentive alienation in policy implementation. In promoting the digitalization of rural adult education, some grass-roots units adopt simplistic material incentive methods, such as providing work delay subsidies and free daily necessities, to "attract" farmers to participate in online learning in order to meet quantitative assessment indicators such as the number of participants and learning hours. This promotion model dominated by external incentives can increase the registration rate in the short term, but it alienates learning behavior into a "task" for obtaining material rewards [3], leading to the instrumentalization of educational value and making it difficult to stimulate learners' internal demand for knowledge itself.

The unsustainability of external incentives and their cultural dilemmas. The participation model based on material rewards cannot cultivate a healthy and sustainable learning culture. When subsidies are canceled or the attractiveness of gifts decreases, the learning participation rate drops sharply. Affected by this, it is difficult for learners to form a virtuous cycle of "learning-application-benefit", and even more difficult to establish a cultural atmosphere in rural communities that honors lifelong learning and capacity building. This instrumental attitude towards participation is inconsistent with the educational philosophy of "independent inquiry and competency orientation", making it difficult for policy promotion effects to be sustained and posing deep challenges to the rooting of digital education in rural society.

4. From "digital divide" to "digital empowerment": path construction

4.1. Short-term strategy: adaptive intervention for precise targeting

Develop localized courses deeply integrated with local knowledge to address the problem of resource mismatch. Rural China is vast, with significant differences in industrial forms, cultural customs, and dialect systems across regions. Therefore, resource adaptability cannot stop at simple translation but requires in-depth "localization" reconstruction. This requires curriculum development to go deep into the fields, combining abstract agricultural scientific theories with local soil characteristics, climatic conditions, dominant varieties, and breeding habits to create "agricultural technology microcourses" such as "Dialect Explanations of Rice Pests and Diseases" and "Practical E-commerce for Characteristic Agricultural Products". This process essentially converts universal knowledge into "local cultural capital", connecting curriculum content with learners' existing knowledge structures and life experiences, thereby significantly reducing their cognitive thresholds and learning resistance.

Construct a physical support system embedded in rural social networks to provide emotional and skill support for initial digital integration. For rural adult learners with weak digital literacy, a purely online learning environment is prone to causing feelings of isolation and helplessness. Drawing on the views of Welser et al. [9], it is crucial to establish physical or virtual "digital learning centers" at the village level, equipped with "digital mentors" who are village cadres, rural teachers, or returning young people. This approach cleverly utilizes the inherent trust relationships and geographical ties in rural "acquaintance societies". The face-to-face support provided by mentors not only solves technical problems of "how to operate" but also conveys emotional support for "learning together", effectively alleviating learners' "technological anxiety" and building a humanized transition bridge from "digital divide" to "digital empowerment".

The core of adaptive intervention is to quickly establish rural adults' sense of learning efficacy through "precise targeting". The advantage of short-term strategies lies in their flexibility and pertinence, which can bypass complex institutional restructuring and directly respond to learners' immediate difficulties. By providing localized content that is "easy to understand, learn, and apply" and localized support that is "accessible and helpful", rural learners can experience the actual benefits of online education in the short term. This successful experience is key to stimulating their internal learning motivation and accumulating their "psychological capital" as learners, laying a solid psychological foundation for more in-depth and systematic learning in the future.

4.2. Long-term mechanism: systematic restructuring to cultivate internal motivation

Construct a collaborative governance ecosystem involving multiple subjects. In the long run, the top-down supply model relying on a single government subject is difficult to meet the complex and changing needs of rural adult education. It is necessary to build a "four-in-one" collaborative governance system including the government, universities and research institutions, enterprises, and village organizations [5]. Form an agile feedback mechanism of "training based on demand", so that real needs from the fields can be quickly converted into the supply of educational products, thereby solving the paradox of resource mismatch at the institutional level and achieving dynamic balance between educational supply and rural development needs.

Promote a fundamental shift in the evaluation system from "access-oriented" to "competency-based". Current policy assessments mainly focus on "access" indicators such as network coverage rate, terminal penetration rate, and the number of online courses. To achieve true empowerment, the core of evaluation must shift to a "competency-based" view of equity [4], i.e., focusing on the substantive improvements rural adults have made in digital literacy, vocational skills, social participation capabilities, and other aspects through education. This means establishing a new set of evaluation indicators, incorporating outcome-oriented indicators such as the mastery of digital skills, the application effect of learned knowledge, and the resulting entrepreneurship, income increase, or quality of life improvement into assessments, thereby guiding governments at all levels to shift their focus from "building infrastructure" to "cultivating capable people".

The ultimate goal of systematic restructuring is to promote the appreciation and transformation of rural residents' cultural capital. From the perspective of cultural capital theory, the weakness of traditional rural education lies partly in its failure to effectively help learners convert internalized knowledge capital into "symbolic capital" and "economic capital" that can be exchanged in the socio-economic field. The design of long-term mechanisms aims to open up this transformation path. Ensure the "market value" of educational content through multi-stakeholder collaboration, and ensure the certification effectiveness of learning outcomes through competency-based evaluation. Empower rural adults so that the new knowledge and skills they acquire through online education can be effectively converted into higher economic income, stronger social adaptability, and fuller cultural confidence. This not only rewrites individual fates but also injects the most lasting and profound internal motivation into rural revitalization.

5. Research conclusion

If digital technology is not embedded in social structures and cultural contexts, it may become a tool for reproducing inequality. From the perspective of cultural reproduction theory, this paper reveals the fairness paradox in online education for rural adults and proposes a transformation path from "technical access" to "capacity building".

The study shows that simply increasing technical investment cannot solve deep-seated educational inequality; it is necessary to reconstruct the concepts and practices of online education from the overall perspective of social structure. Future policies should focus on the integration of technology, content, and people to achieve true digital inclusion. Specifically, while popularizing technology, attention should be paid to the appropriateness of educational content and the subjectivity of learners. Through multi-stakeholder collaboration and systematic reform, a more inclusive and effective online education system for rural adults should be constructed.

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