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Exploring the Influence of Internet Usage Attitudes on Educational Equity among Chinese Migrant Workers: A Regional Analysis

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Abstract: As urban builders, migrant workers (rural residents working in cities) should fairly enjoy urban educational resources. However, due to their social status, they face numerous educational challenges. This study explores how Chinese migrant workers' attitudes towards Internet usage influence educational equity, particularly in an environment where the Internet has become indispensable for learning, work, and daily life among Chinese residents. Using ANOVA and correlation analysis, the study investigates the relationship and influencing factors between migrant workers' attitudes towards Internet usage and educational equity. The research data were obtained from a 2020 survey conducted by the Peking University Chinese Social Sciences Survey Center, focusing primarily on Chinese migrant workers. The findings reveal that migrant workers' attitudes towards Internet usage significantly impact educational equity; groups that place greater emphasis on Internet usage exhibit better educational equity than others. Although the statistical differences in Internet usage attitudes among different regions are not significant, educational equity disparities among regions remain statistically significant. Based on these findings, recommendations are provided at the family, school, and government levels, aiming to address the digital divide, establish remote open education platforms, and improve the household registration system to enhance educational equity for migrant workers.

Keywords: Educational Equity; Internet Usage Attitude; Educational Gini Coefficient; Migrant Workers.

1. Introduction

In the 21st century information age, rapid globalization and technological advancements have significantly transformed our lifestyles and work dynamics. Internet technology, in particular, not only revolutionizes communication but also offers unparalleled opportunities for information acquisition and learning. In China, fueled by economic growth and government initiatives, the Internet's penetration in education has reached remarkable levels. With over 1 billion Internet users in China, nearly every citizen can access information and knowledge online(Ke, 2024). Migrant workers who possess rural household registration and work in urban areas have made significant contributions to urban development. They should be entitled to the same educational rights as urban residents. However, due to various factors such as institutional, school-related, and familial reasons, there is still a phenomenon of educational inequality (Guo, 2001). However, the question of whether this widespread technology use has truly resulted in equal access to education remains unresolved. In this context, the issue of educational equality for China's migrant workers, vital contributors to urban development, deserves attention.

Despite the Internet offering abundant resources in China, educational equity issues persist. Migrant workers, integral to members of Chinese society, have long been a focal point of social concern regarding education. Factors such as the household registration system, economic disparities, and regional differences contribute to the unfair treatment faced by migrant workers and their children in education (Guo, 2001). Nevertheless, as a medium for information transmission, the Internet presents an opportunity for knowledge dissemination among migrant workers.

In this setting, the Internet, as a novel information channel, opens up new possibilities for education. Emerging forms of education, including online education, distance learning, and MOOCs, offer individuals diverse learning options (Zhang et al., 2019). Notably, online education has become mainstream during the pandemic, further solidifying the Internet's role in the education sector. Consequently, the attitudes of migrant workers towards Internet usage will play a crucial role in enhancing educational equity.

Al (2012) conducted a study on the attitudes of students at the King Saud University College of Education towards Internet usage and similarly found that groups with high attitudes towards Internet usage tended to increase behaviors related to educational and cultural purposes. Family attitudes towards Internet usage also influence adolescent Internet usage behaviors (Günaydın, 2022). Due to the impact of technology and the Internet on knowledge acquisition, respondents with higher levels of Internet literacy, compared to traditional forms, are more inclined to learn through mobile applications and video content, integrating modern technology into their courses, and using it for learning outside the classroom (Szymkowiak, 2021). Attitudes towards Internet usage are related to individuals' emphasis on the Internet as a learning and information channel, reflecting their reliance on and usage habits of the Internet. Researchers use the educational Gini coefficient to measure educational outcome equity (Zhang, 2013). The educational Gini coefficient is calculated on a regional basis, based on the cumulative population proportion at each educational level compared to the cumulative proportion of education years received by the population at each educational level. The Gini coefficient has a maximum value of 1 and a minimum value of 0. A value closer to 1 indicates greater inequality, while a smaller coefficient indicates greater equity.

Therefore, attitudes towards Internet usage influence

individuals' behavior in using the Internet to acquire knowledge, thereby altering individuals' education duration and qualifications (Wu et al., 2020), ultimately manifesting in personal educational equity, regional educational equity, and national equity. The Chinese government recognizes the importance of educational equity and has issued relevant documents to address issues of educational inequality. The Chinese government has formulated and issued several policy documents aimed at strengthening education informatization. These policies seek to leverage the Internet and other technologies to establish an educational platform that enables every resident to learn at any time. Against this policy background, this study aims to explore the relationship between migrant workers' attitudes towards Internet usage and educational equity, along with influencing factors. It provides valuable insights for policymakers to formulate more equitable and effective education policies.

2. Methodology

2.1. Research Design

This study analyzes the relationship between Internet usage attitudes and educational equity through correlation analysis, and examines the differences in Internet usage attitudes and educational equity across different regions using ANOVA. The variables employed include attitudes towards internet usage, the educational Gini coefficient, and region.

2.1.1. Attitudes Towards Internet Usage

Two variables from the survey questionnaire represented attitudes towards Internet Usage: "Importance of the Internet as an information channel" and "Importance of the Internet for learning." Both variables use a Likert scale ranging from 1 to 5, where 1 indicates "very unimportant" and 5 indicates "very important." The average of these two variables yields values ranging from 1 to 5. The composite variable representing Internet Usage attitude was treated as a continuous variable.

2.1.2. Educational Gini coefficient

This study utilized the educational Gini coefficient to measure educational equity and assessed disparities in educational equity based on the cumulative proportions of migrant workers across different educational levels. Based on the characteristics of education and existing research (Zhang, W., 2013), the educational Gini coefficient was calculated. Calculate the educational Gini coefficient for the region at the county level, serving as the individual educational Gini coefficient.

2.1.3. Region

Based on the province where the samples were located, a region variable was generated with four categories: Code 1 for the Eastern region, Code 2 for the Central region, Code 3 for the Western region, and Code 4 for the Northeastern region.

2.2. Study Participants

The research data utilized in this study were derived from the 2020 survey of China conducted by Peking University, known as the Chinese Household Panel Studies.The selection criteria were respondents with rural household registration who worked in urban areas. The filtered migrant worker sample comprised 4,775 individuals.

2.3. Research Tools

This study uses Stata 17.0 and Excel 2016 for data organization and statistical analysis. Stata 17.0 is employed for correlation and variance tests, while Excel 2016 is used for data aggregation and statistical calculations.

3. Results

3.1. Attitudes Towards Internet Usage and Education Equity

Internet usage attitudes and the Educational Gini coefficient are numerical variables. In Table 1, the correlation analysis examines the relationship between these two variables. The Pearson correlation test reveals a coefficient of -0.1659 ($P < 0.01$), indicating statistical significance. This result suggests that a greater emphasis on Internet usage is associated with a lower Educational Gini coefficient. In other words, migrant workers who value Internet usage more highly tend to experience better educational equity.

Table 1. Attitudes towards Internet Usage and Educational Equity

Variables	Pearson correlation test	
	Education Gini coefficient	Attitudes towards Internet Usage
Education Gini coefficient	1	
Attitudes towards Internet Usage	-0.1659*	1

Note: Significance levels: * $p < 0.01$

3.2. Regional Grouping and Attitudes Towards Internet Usage

In Table 2, the attitudes toward Internet usage among migrant workers across different regions are similar, with the Western region having the highest mean value of 3.1117 and the Northeastern region the lowest at 3.0283.

An ANOVA was conducted to examine whether significant differences exist in Internet usage attitudes among migrant workers across regions. The F-value is 0.37, and the P-value is 0.7716, which exceeds the 0.01 significance level. This indicates that the result is not statistically significant. Therefore, there is insufficient evidence to suggest differences in attitudes toward Internet usage across regions.

Table 2. Regional grouping and Attitudes towards Internet Usage

Variables	Attitudes towards Internet Usage		F	P
	Mean	Std. err.		
Region			0.37	0.7716
-Eastern Region	3.0461	0.0430		
-Central Region	3.0865	0.0491		
-Western Region	3.1117	0.0522		
-Northeastern Region	3.0283	0.1337		

3.3. Regional Grouping and Education Gini Coefficient

In Table 3, the Central region has the highest Educational Gini coefficient at 0.3120, followed by the Western region at 0.3093 and the Eastern region at 0.2927. The Northeast region exhibits the lowest coefficient at 0.2648, representing a difference of 0.0472 compared to the Central region.

An ANOVA analysis is conducted to examine whether significant disparities exist in the Educational Gini coefficients across these regions. The F-value is 47.11, with a P-value less than 0.01, indicating statistical significance. This suggests notable differences in Educational Gini coefficients among at least two of the four regions.

Table 3. Regional grouping and Education Gini coefficient

Variables	Education Gini coefficient		F	P
	Mean	Std. err.		
Region			47.11	< 0.01
-Eastern Region	0.2927	0.0027		
-Central Region	0.3120	0.0033		
-Western Region	0.3093	0.0034		
-Northeastern Region	0.2648	0.0030		

4. Discussion

4.1. Migrant Workers' Attitudes Towards Internet Usage and Education Equity

Attitude is a learned tendency that represents a person's overall feelings toward a given object, often influencing responses to stimuli in consistent favorable or unfavorable ways (Douglass, 1977). Because attitudes are learned, they are also malleable—things that satisfy human needs are positively reinforced and can change based on experiences with the object of stimuli. Fishbein et al. (1977) proposed the Theory of Reasoned Action, which posits a correlation between attitudes and behaviors, where individual behavioral intentions are determined by their attitudes toward the behavior and subjective norms in their surroundings. Moreover, user attitudes toward Information and Communication Technologies (ICT) effectively drive the successful transformation of educational practices and processes. Conversely, non-use of the Internet is not always due to lack of access but often stems from insufficient capability and negative attitudes toward ICT (Brandtweiner et al., 2008). From a theoretical perspective, confirming the relationship between attitudes and learning behaviors provides a theoretical basis for exploring the correlation between migrant workers' Internet usage attitudes and educational equity.

Internet usage attitudes significantly impact educational efficacy and individual worldviews and behaviors (Xiang, 2017). In Table 1, it is observed that groups perceiving Internet usage as more important exhibit lower educational Gini coefficients, indicating better educational equity compared to groups perceiving the Internet as less important. On the one hand, educators' attitudes toward Internet usage significantly influence the implementation of educational technologies in classrooms and ultimately determine the effectiveness of using these technologies in teaching. Educational practitioners' attitudes toward information technology also significantly influence teaching and learning behaviors (Bullock, 2004). On the other hand, Internet usage attitudes similarly influence students' learning behaviors. Tu et al. (2022), through a questionnaire survey of 869 university students using a web attitude scale, found that web attitudes mediate web behaviors across three dimensions: cognitive, emotional, and behavioral tendencies. Since secondary school students are minors, their parents influence their web attitudes. Positive parental web attitudes positively impact students' information literacy (Peng, 2019), with parents holding higher web attitudes more willing to engage their children in Internet-related activities, thereby enhancing expectations for Internet use in schools (Chen & Tu, 2018).

Moreover, Peng (2019) suggests that parental web attitudes have a direct significant positive impact on parental ICT attitudes and can actively provide strong ICT support for students. ICT can bridge educational inequalities caused by individual differences or social status disparities. Gao (2014) argues that ICT development has achieved equal allocation of educational resources and promoted educational equity in urban and rural China. Wen et al. (2023) analyzed data from 31 provinces and cities in China from 2013 to 2020 and found that ICT significantly influences educational equity with spatial characteristics, indicating that the development of educational informatization in adjacent areas contributes to enhancing local educational equity. Furthermore, confirming the positive significant impact of migrant workers' Internet usage attitudes on educational equity (Tables 1).

Similarly, web attitudes influence rural student behaviors. Most rural students have a positive attitude toward Internet usage, and students' web attitudes and parental attitudes toward Internet usage influence web behaviors (Jing, 2013). Additionally, Xiang (2017) suggests that due to the vague nature of web attitudes, students may develop negative web attitudes or even Internet anxiety.

Furthermore, some scholars have studied the relationship between web usage attitudes, web self-efficacy, and educational equity. Web self-efficacy refers to an individual's perception of their ability to use the web to complete tasks (Tsai et al., 2003). Positive web attitudes are significantly positively correlated with web self-efficacy, and groups with strong web self-efficacy are more likely to extensively use the Internet for educational purposes such as research, downloading electronic resources, and email communication. Wang and Gong (2013) reached similar conclusions, showing that individuals with positive, affirmative web attitudes are more proactive in using the web, learning various web skills, and having stronger web self-efficacy. There is a significant positive correlation between web self-efficacy and academic performance, with web learning self-efficacy playing a significant mediating role between online collaborative learning and academic performance (Yu, 2023). Yang et al. (2023) reached the same conclusion, analyzing data from 1,623 university students from eight universities in Guangdong Province, China, showing a significant positive

relationship between students' self-efficacy and web learning performance. From the perspective of web self-efficacy mediation effects, this study confirms that migrant worker groups who prioritize web usage attitudes tend to have higher educational levels.

4.2. Regional Grouping and Attitudes Towards Internet Usage

Migrant workers are part of China's mobile population, moving from rural to urban areas for employment, where there exist disparities in Internet development between urban and rural regions. Attitudes towards Internet usage are influenced by the level of Internet development in the city of residence: higher levels of urban information infrastructure enhance accessibility and strengthen individuals' identification with Internet usage. China's Internet development path initially focused on urban areas before gradually extending to rural regions. Rural Internet development has undergone four stages: from computer application exploration to Internet popularization, then to targeted poverty alleviation through Internet access, and finally to digital rural construction. The introduction of the 2016 National Internet Poverty Alleviation Action Plan highlighted efforts to address information infrastructure gaps in deeply impoverished areas (Zhang & Tu, 2024), gradually improving rural Internet accessibility.

Despite over a decade of Internet infrastructure development in China, including widespread coverage of fiber-optic broadband and mobile networks, many remote rural areas still lack comprehensive Internet infrastructure. In 2016, only 32.4% of schools met standards for teacher education in information technology applications, limiting educational digitalization (Xing & Zhang, 2024). This restriction affects rural residents, including migrant workers employed in urban areas, thereby limiting their Internet usage attitudes. Conversely, urban residents benefit from more accessible and extensive information channels and recognize the crucial role of digital technologies in learning, living, and working, thereby investing more time and resources into digital literacy (Bao et al., 2024).

However, despite the expectation that migrant workers in urban areas should enjoy equal accessibility to information as urban residents, research indicates that larger, developed cities pose greater challenges for migrant integration (Tian et al., 2019). These integration challenges offset the advantages of high Internet development levels in large cities, reducing Internet accessibility for migrant workers. Huang et al. (2024) similarly concluded from a survey of 169,989 migrant workers in China that larger urban areas negatively impact social integration among migrant workers, with greater residential segregation and social isolation. Furthermore, within the migrant population, non-regular migrants constitute 59%, representing the most vulnerable subgroup with lower social integration compared to regular migrant workers. Thus, despite higher levels of urban informationization, migrant workers face greater integration difficulties in large cities compared to other urban areas, leading to no significant differences in Internet usage attitudes between migrant workers moving from rural to the eastern, central, western, and northeastern regions (Table 2).

4.3. Regional Grouping and Education Gini Coefficient

Regional disparities in educational equity are influenced by factors such as geographical location, economic development, educational policies, funding, and population mobility. Similar issues of educational inequity exist in other countries. For instance, Germany faces negative impacts on educational equity between its eastern and western regions due to severe aging and population outflow (Huang, 2020). In France, the government has implemented the "Local Educational Support Plan" to address regional educational imbalances, specifically targeting rural and surrounding areas to provide comprehensive educational support to children and adolescents (Chen & Zhu, 2023).

Similarly, China, as a country with significant population mobility, experiences imbalances in economic development across regions, leading to a siphon effect where economically developed areas attract a large number of talents and labor. Migrant workers constitute the majority of China's floating population, which reached 376 million in 2020, with about 200 million being migrant workers (Lei & Zhang, 2022). Furthermore, China's population movement predominantly flows from the underdeveloped central and western regions to the more developed eastern regions. Provinces with strong economies see significant population inflows, while economically less developed provinces experience large population outflows (Wang, 2021). Consequently, the substantial migrant worker population drives economic development, and compared to the central and western regions, the eastern regions have higher educational levels, consistent with our findings that the educational Gini coefficients are higher in the central and western regions compared to the eastern regions (Tables 3).

Additionally, economically developed regions invest more in education, resulting in better educational equity. Since the fiscal system reform in 1985, local governments in China have increasingly borne the financial burden of basic education. The unequal distribution of economic resources among regions has led to increasing disparities in educational opportunities (Lai & Zheng, 2005). A study by Shi et al. (2021) of 12 Chinese universities found that local government educational investment significantly impacts individual educational attainment. This further confirms that educational equity among migrant workers in the economically developed eastern regions is superior to that in the central and western underdeveloped regions (Tables 3).

5. Conclusion

This study employs correlation analysis and ANOVA to explore the relationship between Chinese migrant workers' attitudes towards Internet usage and educational equity. The findings indicate that migrant workers' Internet usage attitudes significantly impact educational equity. Those who place greater importance on Internet usage tend to have better educational attainment, which in turn enhances their educational equity. Regional disparities in education remain pronounced. Although there are no significant differences in attitudes towards Internet usage among migrant workers across different regions, those in economically developed eastern regions exhibit better educational equity compared to their counterparts in central and western regions.

Based on the analysis results, recommendations are proposed at three levels: family, school, and government.

First, migrant families should enhance their awareness of the importance of the Internet and allocate a higher proportion of household spending to create a conducive Internet environment, establishing infrastructure that allows family

members to engage in online learning and work at any time. Parents themselves should cultivate a positive attitude towards Internet usage, fostering a strong culture of information technology use at home. They should instill correct Internet usage attitudes in their children, provide necessary assistance, and supervise their children's Internet activities to prevent distractions due to insufficient self-control during online learning (Li, 2021). Improving digital literacy and information retrieval skills among migrant workers and their families is crucial. This includes enhancing training in Internet usage, increasing self-efficacy in Internet use, and improving the effectiveness and satisfaction of online learning (Wang & Gong, 2013).

Second, schools should provide compensatory guidance on information and communication technology usage for children from "digitally disadvantaged" families to mitigate the reproduction mechanism of educational inequality resulting from internal economic issues (Li, 2021). Establishing remote open education platforms allows excellent teachers to deliver educational information to learners via the Internet (Liu, 2023). This ensures that migrant workers, whether in urban or rural areas, can access education, thus promoting more equitable educational rights. Additionally, higher education training programs should be further refined to meet societal needs, establishing employment guidance systems in universities to timely provide matching employment information to rural graduates, helping migrant workers broaden their employment opportunities (Ma, 2019) and improving their family economic conditions to maximize educational benefits.

Finally, the government should implement policies to reduce educational disparities caused by the household registration system and improve the urbanization rate of registered populations, effectively assisting rural students in accessing urban educational resources and alleviating inequalities caused by institutional constraints (Shi & Yu, 2021). Local governments should leverage their role in educational development. The state should balance regional educational funding distribution, prioritizing and increasing financial support for rural education, ensuring that the children of migrant workers can equally enjoy quality educational resources, whether in urban or rural areas (Shi & Yu, 2021). The government should play a macro-control role to optimize the labor market and improve the matching of educational outcomes. Human resources should be allocated reasonably to enhance the friendliness of vocational colleges towards migrant workers, improving their skills and alleviating the issue of wage depreciation caused by over-education (Ma, 2019).

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