Iranian Journal of Educational Sociology

Journal Website

Article history:
Received 01 November 2025
Revised 12 February 2026
Accepted 19 February 2026
Published 01 May 2026

Iranian Journal of Educational Sociology

Volume 9, Issue 3, pp 1-12

Quarterly
Iranian Journal of Educational Sociology

E-ISSN: 2645-3460

Investigating the Impact of Inequality in Access to Digital Technologies on the Quality of Education in Different Regions (Urban and Rural) of Marvdasht County

Farzad. Poorgholamy[1], Ali Mohammad. Ahmadi Gharacheh [1*], Fatemeh. Shafiee[2]

[1] Assistant Professor, Department of Psychology and Educational Sciences, Payame Noor University, Tehran, Iran
[2] Master of Science in Curriculum Planning, Payame Noor University, Tehran, Iran

*** Corresponding author email address**: amag2004@pnu.ac.ir

A r t i c l e I n f o

Article type:
Original Research

How to cite this article:
Poorgholamy, F., Ahmadi Gharacheh, A. M., & Shafiee, F. (2026). Investigating the Impact of Inequality in Access to Digital Technologies on the Quality of Education in Different Regions (Urban and Rural) of Marvdasht County. *Iranian Journal of Educational Sociology, 9*(3), 1-12.
https://doi.org/10.61838/kman.ijes.1472

A B S T R A C T

Purpose: The present study aimed to investigate the impact of inequality in access to digital technologies on the quality of education among male upper secondary school students in urban and rural areas of Marvdasht County.

Methods and Materials: The study employed an applied descriptive-survey design with a correlational approach. The statistical population consisted of all male upper secondary school students in urban and rural areas of Marvdasht County during the 2025–2026 academic year. Based on Cochran's formula, 375 students were selected through stratified random sampling. Data collection instruments included the PISA ICT Familiarity Questionnaire (Oecd, 2023) and the Internet Literacy Scale for High School Students (Cheng, 2023). Data were analyzed using structural equation modeling with the partial least squares approach and independent samples t-tests in IBM SPSS Amos.

Findings: The findings indicated significant differences between urban and rural students in all major research variables at $p < .001$. Rural students demonstrated significantly lower levels of access to hardware, access to stable internet, digital literacy, and educational quality compared to urban students. Digital literacy was identified as the strongest predictor of educational quality ($\beta = 0.41$), followed by access to stable internet ($\beta = 0.35$) and access to hardware ($\beta = 0.21$). The structural model explained 67% of the variance in educational quality ($R^2 = 0.67$). In addition, digital literacy played a significant partial mediating role in the relationship between technological access and educational quality.

Conclusion: The results demonstrate that the digital divide constitutes a major educational inequality affecting the quality of education among secondary school students. Educational quality is influenced not only by physical access to digital technologies but also by students' digital literacy competencies.

Keywords: *digital divide, educational quality, digital literacy, upper secondary school students, rural education, urban-rural inequality, Marvdasht County.*

1. Introduction

The expansion of digital technologies over the past two decades has fundamentally transformed educational systems worldwide and has redefined the concepts of teaching, learning, educational interaction, and access to knowledge resources. The emergence of virtual learning platforms, online educational content, interactive technologies, and internet-based communication tools has enabled educational systems to transcend temporal and geographical boundaries and provide broader educational opportunities for students (Oecd, 2023; Tang et al., 2025). Nevertheless, despite these advancements, unequal access to digital technologies has created new forms of educational inequality, particularly in developing countries and disadvantaged regions. This phenomenon, commonly conceptualized as the "digital divide," has become one of the most significant barriers to educational justice and equal learning opportunities in the contemporary era (Assefa et al., 2025; Gohain & Konwar, 2025).

The digital divide extends beyond mere access to technological devices and encompasses disparities in internet connectivity, digital literacy, technological skills, quality of access, and effective utilization of digital technologies for educational purposes (Mathrani et al., 2023; Tan & Chen, 2022). In educational contexts, students who lack adequate access to computers, smartphones, stable internet, and digital learning environments often experience lower educational participation, weaker academic performance, and reduced opportunities for educational advancement (Alexiou, 2022; Di Pietro & Castano-Munoz, 2025). Consequently, unequal digital access has increasingly been recognized not only as a technological issue but also as a multidimensional social and educational challenge associated with social justice, educational equity, and human development (Assefa et al., 2025; Fang et al., 2025).

The significance of this issue became particularly evident during and after the COVID-19 pandemic, when educational systems worldwide were compelled to shift toward virtual and hybrid learning environments. Under such conditions, students residing in rural or socioeconomically disadvantaged regions faced substantial barriers in participating effectively in online education due to inadequate infrastructure and limited technological resources (Mathrani et al., 2023; Tang et al., 2025). Studies conducted across different countries demonstrated that unequal access to digital technologies significantly widened educational gaps between urban and rural students and negatively affected learning outcomes and educational quality (Alexiou, 2022; Astari & Yulianto, 2025). In many cases, the lack of stable internet access and insufficient digital skills prevented students from engaging in online learning activities, accessing educational content, or interacting effectively with teachers and peers (Kour & Mirza, 2026; Ngoveni, 2025).

Educational quality is one of the most important indicators of educational system effectiveness and includes dimensions such as learning achievement, student engagement, educational satisfaction, instructional interaction, access to learning resources, and assessment opportunities. In the digital era, the quality of education is increasingly dependent on the extent to which students and teachers can utilize digital technologies effectively within teaching and learning processes (Hassler et al., 2025; Yu et al., 2025). Technological infrastructure alone, however, is insufficient to guarantee educational quality. Students' digital literacy, teachers' technological competencies, institutional support, and the quality of digital implementation are also critical determinants of successful educational outcomes (Cheng et al., 2023; Li et al., 2025). Therefore, the relationship between digital access and educational quality should be examined from a multidimensional perspective that incorporates both technological and human factors.

Digital literacy has emerged as one of the most influential variables in understanding educational inequalities associated with digital access. Digital literacy refers to individuals' ability to access, evaluate, manage, utilize, and produce information through digital technologies in an ethical and effective manner (Cheng et al., 2023). Students with higher levels of digital literacy are generally more capable of navigating online learning environments, evaluating educational information critically, communicating effectively in digital settings, and adapting to technological learning demands (Li et al., 2025; Yu et al., 2025). Conversely, students with limited digital literacy often encounter difficulties in utilizing educational technologies effectively even when physical access to devices and internet services is available (Malarvizhi & Geetha, 2025). This issue highlights the importance of considering digital literacy not only as an educational outcome but also as a mediating mechanism linking technological access to educational quality.

Recent meta-analytical evidence further supports the central role of digital literacy in educational achievement and learning quality. For instance, studies by Li et al. and Yu

Iranian Journal of Educational Sociology
E-ISSN: 2645-3460

et al. demonstrated that digital literacy has a substantial positive relationship with students' academic achievement and learning engagement across different educational contexts (Li et al., 2025; Yu et al., 2025). Similarly, Di Pietro and Castano-Munoz reported that the educational effects of technology are significantly stronger when disadvantaged students possess adequate digital competencies and institutional support (Di Pietro & Castano-Munoz, 2025). These findings suggest that the mere provision of hardware and internet access without simultaneous development of digital literacy may fail to reduce educational inequalities effectively.

In developing countries, the digital divide is often intensified by structural inequalities such as poverty, geographical isolation, inadequate educational investment, and limited technological infrastructure (Assefa et al., 2025; Tang et al., 2025). Rural areas are particularly vulnerable because of weaker internet coverage, insufficient technological facilities in schools, and lower socioeconomic conditions of households (Kour & Mirza, 2026; Ngoveni, 2025). Teachers in rural schools frequently report difficulties integrating information and communication technologies into instructional practices due to unstable connectivity, lack of training, and insufficient institutional support (Astari & Yulianto, 2025; Chaubi et al., 2025). Consequently, students in these regions often experience lower educational quality and reduced access to modern learning opportunities compared to their urban counterparts.

The Iranian educational system has also encountered substantial challenges regarding digital inequality and unequal educational access. Although significant efforts have been made to expand educational technologies and online learning platforms in recent years, considerable disparities remain between urban and rural regions in terms of internet infrastructure, technological facilities, and digital competencies (Alizadeh et al., 2023; Salem et al., 2024). Research conducted in Iran indicates that rural students frequently face limitations related to weak internet connectivity, insufficient digital devices, and lower levels of digital literacy, all of which negatively influence educational participation and academic outcomes (Ghasemi, 2023; Mohammadpour, 2024).

Several Iranian studies have specifically emphasized the relationship between digital inequality and educational injustice. Abbasi Kasbi highlighted that rural communities in Iran continue to experience substantial technological deprivation despite national development policies aimed at reducing the digital divide (Abbasi Kasbi, 2021). Rezaei et al. demonstrated that policy-making processes related to rural digital literacy in Iran suffer from inadequate coordination and insufficient long-term strategic planning (Rezaei et al., 2023). Likewise, Vaziri argued that digital inequality has become an important sociological factor contributing to unequal educational quality across different provinces and regions of Iran (Vaziri, 2025).

Empirical evidence from Iran also suggests that digital inequalities are associated with broader educational consequences, including educational dropout and reduced academic motivation. Ebrahimi Sirizi et al. identified educational inequality and limited access to educational resources as major factors contributing to educational dropout among disadvantaged Iranian students (Ebrahimi Sirizi et al., 2025). Similarly, Yousefi emphasized that digital justice and equal access to educational technologies are essential prerequisites for achieving educational equity in rural regions of Iran (Yousefi, 2025). Mirzaei further reported significant differences between urban and rural students in terms of access to digital tools and educational opportunities within the Iranian educational system (Mirzaei, 2025).

Theoretical perspectives on the digital divide have evolved considerably in recent years. Early conceptualizations focused primarily on physical access to technology, often referred to as the "first-level digital divide." However, contemporary approaches recognize additional dimensions, including differences in digital skills, patterns of technology use, and educational outcomes associated with technology utilization (Fang et al., 2025; Tan & Chen, 2022). This multidimensional perspective suggests that educational inequalities cannot be fully understood solely through measures of technological ownership or internet connectivity. Instead, the interaction among access, digital literacy, social context, and educational implementation should be examined comprehensively (Mathrani et al., 2023; Tang et al., 2025).

Another important issue concerns the moderating role of geographical context in shaping digital inequalities. Urban and rural regions differ substantially in terms of infrastructure availability, economic resources, teacher expertise, and institutional support systems (Karimi et al., 2024; Mohammadpour, 2024). These contextual differences may alter the strength and direction of relationships between technological access, digital literacy, and educational quality. For example, improvements in internet access may produce stronger educational benefits in rural areas where technological deprivation is more severe compared to urban

Iranian Journal of Educational Sociology
E-ISSN: 2645-3460

regions where baseline access is already relatively high (Astari & Yulianto, 2025; Kour & Mirza, 2026). Understanding such moderating effects is essential for designing effective educational policies and targeted technological interventions.

Despite the growing body of international and national literature on digital inequality, several important research gaps remain. First, many previous studies have examined digital access or digital literacy independently rather than simultaneously investigating their combined effects on educational quality (Shafiei et al., 2023; Tang et al., 2025). Second, limited attention has been devoted to the mediating role of digital literacy in explaining how technological access influences educational outcomes among secondary school students. Third, relatively few studies in Iran have employed structural equation modeling to investigate the complex relationships among digital access, digital literacy, educational quality, and geographical context simultaneously (Karimi et al., 2024; Vaziri, 2025). Moreover, research focusing specifically on male upper secondary school students in regions characterized by substantial urban-rural disparities remains scarce.

Marvdasht County in Fars Province represents a particularly important context for investigating these issues because it includes both urban centers with relatively developed technological infrastructure and rural regions facing infrastructural and educational limitations. The coexistence of these contrasting educational environments provides an appropriate setting for examining the extent to which digital inequalities influence educational quality among students. Furthermore, understanding these dynamics may contribute to the development of evidence-based educational policies aimed at reducing digital inequalities and promoting educational justice in less advantaged regions of Iran (Naseri, 2025; Yousefi, 2025).

Given the increasing importance of digital technologies in contemporary educational systems, the persistence of urban-rural digital inequalities, and the limited empirical evidence regarding the mediating role of digital literacy and the moderating role of geographical region in Iran, the present study aimed to investigate the impact of inequality in access to digital technologies on the quality of education among male upper secondary school students in urban and rural areas of Marvdasht County.

2. Methods and Materials

The present study was applied in terms of purpose and descriptive-survey in nature with a correlational design. The study was conducted to investigate the impact of inequality in access to digital technologies on the quality of education among male upper secondary school students (Grades 10, 11, and 12) in Marvdasht County.

The statistical population consisted of all male upper secondary school students in urban and rural areas of Marvdasht County during the 2025–2026 academic year. According to the latest statistics from the Marvdasht County Department of Education, the total number of male upper secondary school students was estimated at approximately 6,200 students, with nearly 75% residing in urban areas and 25% in rural areas. The sample size was determined to be 362 participants using Cochran's formula with a 5% margin of error and a 95% confidence level. To compensate for incomplete questionnaires, 400 questionnaires were distributed, of which 375 usable questionnaires were returned (response rate = 93.7%).

Sampling was conducted using a stratified random sampling method. Accordingly, the population was divided into two strata, namely "urban" and "rural," and samples were then selected proportionally to the population size of each stratum through simple random sampling. The final sample consisted of 279 urban students and 96 rural students.

The research instruments included a combined questionnaire composed of two internationally recognized standardized questionnaires.

First, access to information and communication technologies was measured using the PISA ICT Familiarity Questionnaire developed and validated by the Organisation for Economic Co-operation and Development (OECD, 2023) and employed in the latest cycle of the Programme for International Student Assessment (PISA 2022). This questionnaire measures students' access to computers, internet connectivity, and other digital tools at home and school, as well as the extent and type of technology use and attitudes toward digital technologies.

Second, digital literacy was measured using the Internet Literacy Scale for High School Students developed and validated by Cheng et al. (Cheng et al., 2023). This 30-item scale consists of eight dimensions, including self-regulation, information processing, critical thinking, collaboration, harm management, ethical awareness, security awareness, and self-identity structuring, and was specifically designed for secondary school students. The validity of the scale was

confirmed through confirmatory factor analysis, and its reliability was supported by a Cronbach's alpha coefficient of .93.

The reliability of the combined questionnaire in the present study was assessed using Cronbach's alpha coefficient. The coefficient was calculated as .91 for the entire instrument, .87 for the technology access component, and .92 for the digital literacy component, indicating satisfactory reliability levels.

Data analysis procedures were conducted at both descriptive and inferential levels. At the descriptive level, frequency, percentage, mean, and standard deviation indices were used to describe the variables. At the inferential level, structural equation modeling with the partial least squares approach was employed to examine the relationships among the research constructs, including technology access, digital literacy, and educational quality, using IBM SPSS Amos Version 24. Model fit was evaluated using the chi-square to degrees of freedom ratio (acceptable range = 1 to 3), Comparative Fit Index (CFI > .90), and Root Mean Square Error of Approximation (RMSEA < .08). In addition, independent samples t-tests were used to compare the mean scores of variables between urban and rural groups. All stages of the research were conducted in accordance with ethical principles, including obtaining informed consent from students and parents and ensuring confidentiality of information.

3. Findings and Results

In this section, the findings obtained from the analysis of data collected from 375 male upper secondary school students in Marvdasht County (279 urban students and 96 rural students) are presented. First, the characteristics of the sample are reported, followed by comparisons of the study variables across the two regions, and finally the results of the structural equation modeling, including hypothesis testing and the moderating role of geographical location.

Table 1

Frequency Distribution of the Sample by Educational Grade and Region

Educational Grade	Urban Areas (n)	Rural Areas (n)	Total (n)	Total Percentage
Grade 10	97	32	129	34.4
Grade 11	96	34	130	34.7
Grade 12	86	30	116	30.9
Total	279	96	375	100

Table 1 presents the distribution of participating students based on educational grade (Grades 10, 11, and 12) and residential region (urban and rural). As shown, out of the total 375 students, 279 students (74.4%) resided in urban areas and 96 students (25.6%) resided in rural areas. This proportion is fully consistent with the actual population distribution of male upper secondary school students in Marvdasht County (approximately 75% urban and 25% rural), indicating the effectiveness of the stratified random sampling procedure in preserving population proportions.

Regarding educational grade, a relatively balanced distribution was observed across the three grades: Grade 10 included 129 students (34.4%), Grade 11 included 130 students (34.7%), and Grade 12 included 116 students (30.9%). This balanced distribution enables meaningful comparisons across different grade levels. The mean age of the sample was calculated as 17.2 years with a standard deviation of 1.1, which corresponds to the normal age range of upper secondary school students (16–18 years).

Table 2

Comparison of Means and Standard Deviations of the Research Variables Across the Two Regions

Variable/Component	Region	n	Mean	SD	t-value	Significance Level
Access to Hardware	Urban	279	3.82	0.74	8.42	$p < .001$
	Rural	96	2.45	0.81		
Access to Stable Internet	Urban	279	3.65	0.82	10.17	$p < .001$
	Rural	96	1.92	0.78		
Digital Literacy	Urban	279	3.71	0.69	9.55	$p < .001$
	Rural	96	2.23	0.72		
Educational Quality (Total)	Urban	279	3.68	0.76	10.88	$p < .001$
	Rural	96	2.10	0.65		

Iranian Journal of Educational Sociology
E-ISSN: 2645-3460

The results in Table 2 indicate that the mean differences between the two regions were statistically significant at $p < .001$ across all components. The largest gap was related to "access to stable internet" (difference = 1.73 points), indicating that rural students face frequent disconnections, low internet speed, and high access costs. The smallest gap was related to "access to hardware" (difference = 1.37 points), although this difference remained substantial. Educational quality in rural areas (2.10 out of 5) was evaluated at a "low" level, whereas educational quality in urban areas (3.68) was evaluated at a "moderate to high" level. These findings demonstrate the existence of a profound digital divide and its direct impact on educational quality.

Table 3

Measurement Model Fit Indices

Index	Obtained Value	Acceptable Value	Status
Chi-square/df Ratio (CMIN/DF)	2.42	1–3	Acceptable
Comparative Fit Index (CFI)	0.94	> 0.90	Acceptable
Goodness-of-Fit Index (GFI)	0.91	> 0.90	Acceptable
Root Mean Square Error of Approximation (RMSEA)	0.062	< 0.08	Acceptable
Normed Fit Index (NFI)	0.90	> 0.90	Acceptable

The measurement model examines the relationships between questionnaire items and latent constructs (main variables). All fit indices were within acceptable ranges. In particular, the RMSEA value of 0.062 (less than 0.08) and the CFI value of 0.94 (greater than 0.90) indicate good model fit. Therefore, the measurement instruments demonstrated adequate construct validity, and the data were consistent with the factorial structure of the model.

Table 4

Summary of Direct Hypothesis Testing Results (Structural Model)

Hypothesis	Path	Standardized Coefficient (β)	Standard Error	Critical Ratio (CR)	Significance Level	Hypothesis Confirmation
H1	Access to Hardware → Educational Quality	0.21	0.05	4.12	$p < .001$	✓
H2	Access to Stable Internet → Educational Quality	0.35	0.05	6.39	$p < .001$	✓
H3	Digital Literacy → Educational Quality	0.41	0.06	7.21	$p < .001$	✓

$R^2 = 0.67$, indicating that 67% of the variance in educational quality was explained by the model.

The results presented in Table 4 indicate that all three direct hypotheses were supported. Digital literacy, with a coefficient of 0.41, was the strongest predictor of educational quality, suggesting that improvements in students' digital skills exert the greatest influence on enhancing educational quality. Access to stable internet ranked second with a coefficient of 0.35, indicating that in the era of virtual learning, internet stability and quality are more important than hardware itself. Access to hardware, with a coefficient of 0.21, had the weakest direct effect; however, as shown in the mediating hypotheses, it also exerted a substantial indirect effect through the enhancement of digital literacy. The final model explained 67% of the variance in educational quality, which is considered a high explanatory power.

Table 5

Results of Mediating Effects Testing (Bootstrap Analysis)

Hypothesis	Indirect Path	Indirect Coefficient	Standard Error	95% CI Lower Bound	95% CI Upper Bound	Hypothesis Confirmation
H4	Hardware → Digital Literacy → Educational Quality	0.18	0.04	0.10	0.27	✓
H5	Internet → Digital Literacy → Educational Quality	0.16	0.04	0.09	0.25	✓

Iranian Journal of Educational Sociology
E-ISSN: 2645-3460

A mediating effect is considered significant when the 95% confidence interval for the indirect coefficient does not include zero. In both hypotheses, the confidence intervals were entirely above zero (lowest bounds = 0.09 and 0.10). Therefore, digital literacy played a partial mediating role in the relationships between access to hardware and internet and educational quality. In other words, part of the positive effect of digital access on educational quality is transmitted through improvements in students' digital skills. This finding further highlights the importance of digital empowerment.

Table 6

Comparison of Path Coefficients Across Urban and Rural Groups

Path	Coefficient in Urban Group	Coefficient in Rural Group	Difference in Coefficients	p-value for Difference
Hardware → Educational Quality	0.24**	0.14	0.10	0.12 (Not Significant)
Internet → Educational Quality	0.32***	0.21*	0.11	0.06 (Marginal)
Digital Literacy → Educational Quality	0.38***	0.47***	-0.09	0.17 (Not Significant)
Hardware → Digital Literacy	0.39***	0.52***	-0.13	0.04 (Significant)
Internet → Digital Literacy	0.33***	0.43***	-0.10	0.04 (Significant)

*p < .05, **p < .01, ***p < .001*

Geographical location (urban versus rural) was examined as a moderating variable. The findings indicate that the differences in path coefficients leading to educational quality (the first three rows) were not statistically significant (p-values = 0.12, 0.06, and 0.17). However, significant differences were observed in the paths leading to digital literacy (the last two rows) (p = 0.04). Specifically, the effect of access to hardware on digital literacy was significantly stronger in rural areas (0.52) than in urban areas (0.39). Similarly, the effect of internet access on digital literacy was greater in rural regions (0.43) than in urban regions (0.33).

Figure 1

Structural Equation Model of the Impact of Inequality in Access to Digital Technologies on Educational Quality (With the Mediating Role of Digital Literacy and the Moderating Role of Geographical Location)

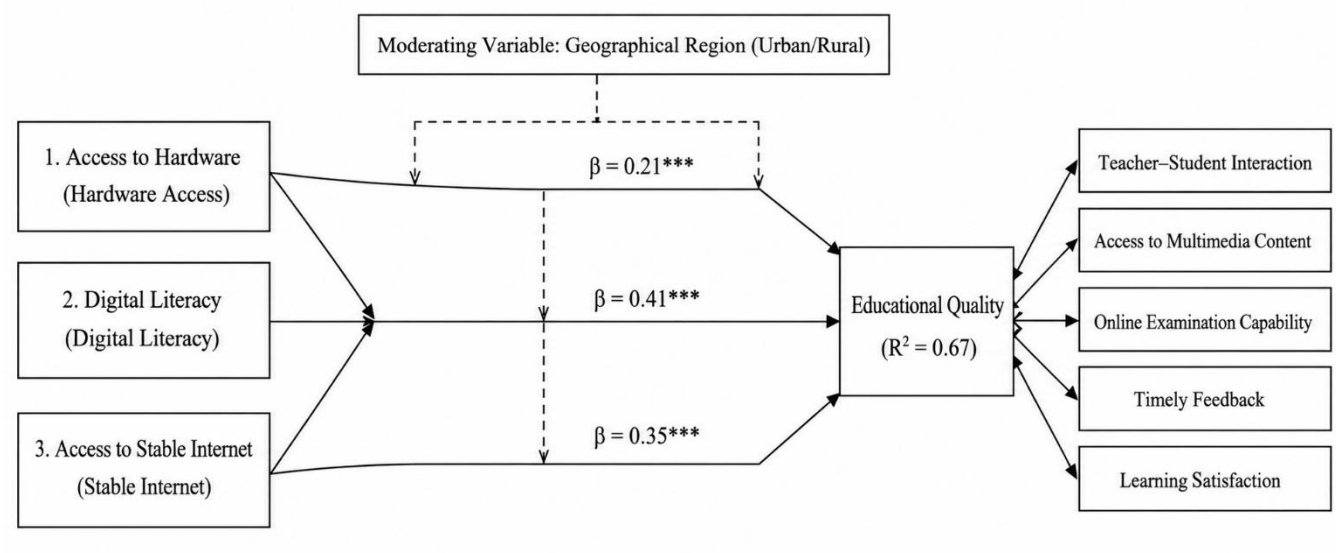

Figure 1 illustrates the final structural equation model of the study. As shown, all direct paths with coefficients of 0.21, 0.35, and 0.41 were statistically significant, and digital literacy exerted the strongest effect on educational quality. Furthermore, the indirect paths (0.18 and 0.16) indicate the

Iranian Journal of Educational Sociology
E-ISSN: 2645-3460

partial mediating role of digital literacy. The moderating effects are also presented in the lower panel of the model.

Table 7

Fit Indices of the Final Structural Model

Index	Obtained Value	Acceptable Value	Status
CMIN/DF	2.86	1–3	Acceptable
CFI	0.91	> 0.90	Acceptable
GFI	0.90	> 0.90	Acceptable
RMSEA	0.070	< 0.08	Acceptable
SRMR	0.058	< 0.08	Acceptable

The final structural model, including direct, indirect, and moderating paths, demonstrated acceptable model fit. The RMSEA value of 0.070 (less than 0.08) and the SRMR value of 0.058 (less than 0.08) indicate low estimation error. In addition, both the CFI and GFI values were at or above 0.90. Therefore, the research model possessed sufficient validity for drawing conclusions.

4. Discussion and Conclusion

The present study aimed to investigate the impact of inequality in access to digital technologies on the quality of education among male upper secondary school students in urban and rural areas of Marvdasht County. The findings revealed a significant digital divide between urban and rural students across all major dimensions, including access to hardware, access to stable internet, and digital literacy. Furthermore, the results demonstrated that digital literacy was the strongest predictor of educational quality, while access to stable internet and hardware also exerted significant direct and indirect effects on educational quality. In addition, geographical region played a moderating role in some of the structural relationships, particularly in the relationships between technological access and digital literacy. Overall, the findings highlight the multidimensional nature of digital inequality and its substantial consequences for educational quality and educational justice.

One of the most important findings of the study was the existence of a substantial gap between urban and rural students in access to digital technologies. Rural students reported significantly lower levels of access to hardware and stable internet compared to urban students. This finding is consistent with previous national and international studies that have emphasized the persistence of digital inequalities in rural and disadvantaged regions (Alexiou, 2022; Shafiei et al., 2023). The results are also aligned with the findings of Mathrani et al., who reported that rural students experienced severe technological disadvantages during online learning periods due to infrastructural deficiencies and socioeconomic barriers (Mathrani et al., 2023). Similarly, studies conducted in Iran have repeatedly demonstrated that rural areas continue to suffer from weaker internet infrastructure, lower access to digital devices, and reduced educational opportunities compared to urban regions (Abbasi Kasbi, 2021; Mirzaei, 2025).

The particularly large difference observed in access to stable internet indicates that internet quality and continuity remain major educational challenges for rural students. This finding supports the argument proposed by Naseri that unstable internet connectivity and weak communication infrastructure continue to create substantial barriers for rural teachers and students in Iran (Naseri, 2025). Moreover, Kour and Mirza reported that insufficient internet coverage and unreliable connectivity are among the most critical barriers preventing effective integration of information and communication technologies in rural schools (Kour & Mirza, 2026). Therefore, the present findings reinforce the notion that unequal internet infrastructure constitutes a structural form of educational inequality that directly limits students' participation in modern educational processes.

The findings also demonstrated that educational quality in rural regions was significantly lower than in urban regions. Rural students reported lower levels of teacher–student interaction, reduced access to multimedia educational content, fewer opportunities for online examinations, weaker feedback systems, and lower learning satisfaction. These findings are consistent with previous studies indicating that digital inequality contributes directly to educational outcome disparities between urban and rural students (Karimi et al., 2024; Mohammadpour, 2024). The findings are also supported by the work of Di Pietro and Castano-Munoz, who concluded that disadvantaged students generally benefit less from educational technologies because

Iranian Journal of Educational Sociology
E-ISSN: 2645-3460

of weaker access conditions and lower institutional support (Di Pietro & Castano-Munoz, 2025).

The reduced educational quality observed among rural students may be explained through several mechanisms. First, limited access to educational technologies reduces opportunities for participation in digital learning environments and restricts access to diverse educational resources. Second, unstable internet connectivity disrupts educational continuity and decreases students' ability to engage effectively with teachers and peers. Third, limited digital literacy may prevent students from fully utilizing available technological resources for learning purposes. Collectively, these factors create cumulative educational disadvantages that negatively affect learning quality and educational achievement. This interpretation is highly consistent with the social justice perspective proposed by Assefa et al., who argued that digital inequality reproduces and intensifies existing educational inequities in developing countries (Assefa et al., 2025).

Another important finding of the study was that digital literacy emerged as the strongest predictor of educational quality. This result suggests that educational quality depends not only on access to technology but also on students' ability to use digital technologies effectively and critically. The finding strongly supports previous research emphasizing the central role of digital literacy in academic achievement and learning effectiveness (Li et al., 2025; Yu et al., 2025). In particular, the meta-analysis conducted by Li et al. demonstrated that digital literacy has a substantial positive effect on students' academic outcomes across different educational contexts (Li et al., 2025). Similarly, Malarvizhi and Geetha found that students with stronger digital literacy skills exhibited higher levels of educational engagement and academic competency (Malarvizhi & Geetha, 2025).

The significant role of digital literacy may be interpreted within the framework of contemporary digital learning theories. In modern educational environments, students are expected not only to access information but also to evaluate, organize, interpret, and apply digital information effectively. Consequently, students with higher digital literacy levels are more capable of adapting to virtual learning environments, utilizing multimedia resources, participating in online discussions, and engaging in self-regulated learning processes. Cheng et al. conceptualized digital literacy as a multidimensional construct involving critical thinking, information processing, collaboration, and ethical awareness, all of which contribute to effective learning performance (Cheng et al., 2023). Therefore, the strong predictive role of digital literacy identified in the present study appears theoretically and empirically justified.

The findings further demonstrated that access to stable internet had a stronger effect on educational quality than access to hardware. This finding suggests that internet quality and continuity are more critical than simple device ownership in contemporary educational systems. This result aligns with studies conducted by Tang et al. and Gohain and Konwar, which emphasized that meaningful participation in online education depends heavily on stable and high-quality internet connectivity (Gohain & Konwar, 2025; Tang et al., 2025). In many educational contexts, students may possess digital devices but remain unable to benefit effectively from online education because of poor connectivity, low internet speed, or high access costs. Accordingly, the present findings support the argument that the digital divide should be conceptualized not merely as a gap in technological ownership but as a broader inequality in the quality and functionality of digital access (Tan & Chen, 2022).

One of the most theoretically important findings of the study was the mediating role of digital literacy in the relationship between technological access and educational quality. The findings indicated that part of the effect of hardware and internet access on educational quality was transmitted indirectly through digital literacy. In other words, improved technological access contributes to educational quality partly because it facilitates the development of students' digital competencies. This finding is highly important because it demonstrates that access alone is insufficient unless accompanied by the skills necessary for effective educational utilization. The result supports previous theoretical perspectives emphasizing the transition from the "first-level digital divide" to the "second-level digital divide," which focuses on differences in digital skills and patterns of technology use (Fang et al., 2025; Tan & Chen, 2022).

This mediating relationship may also explain why some technological interventions fail to improve educational outcomes substantially. If students are provided with digital devices and internet access without adequate digital literacy training, they may not utilize these technologies effectively for educational purposes. Hassler et al. similarly emphasized that the effectiveness of educational technologies depends heavily on implementation quality, digital competencies, and contextual support systems (Hassler et al., 2025). Therefore, digital literacy should be regarded as a central mechanism through which technological resources influence educational quality.

Iranian Journal of Educational Sociology
E-ISSN: 2645-3460

The moderating role of geographical region constitutes another important contribution of the study. The findings revealed that the effects of hardware and internet access on digital literacy were significantly stronger in rural regions compared to urban regions. This suggests that improvements in technological access may produce greater educational benefits in disadvantaged rural settings where baseline technological opportunities are relatively limited. This finding is consistent with the conclusions of Astari and Yulianto, who found that technological interventions tend to have stronger transformative effects in educationally underserved rural regions (Astari & Yulianto, 2025). Similarly, Ngoveni reported that teachers and students in rural educational contexts are often highly motivated to utilize digital technologies but remain constrained by infrastructural limitations (Ngoveni, 2025).

The stronger relationship between technological access and digital literacy in rural areas may also be explained through the principle of marginal utility. In contexts characterized by severe technological deprivation, even modest improvements in internet connectivity or hardware availability may substantially increase students' opportunities for digital learning and skill development. Conversely, in urban contexts where baseline technological access is already relatively high, additional improvements may yield comparatively smaller educational gains. This interpretation is consistent with sociological analyses emphasizing the contextual nature of digital inequality and educational development (Vaziri, 2025; Yousefi, 2025).

The high explanatory power of the structural model represents another noteworthy aspect of the findings. The model explained 67% of the variance in educational quality, indicating that digital access and digital literacy are highly influential determinants of educational quality among upper secondary school students. This finding reinforces the growing international consensus that digital inequality has become one of the primary educational challenges of the contemporary era (Assefa et al., 2025; Tang et al., 2025). Moreover, the strong model fit indices suggest that the conceptual framework employed in the study was theoretically coherent and empirically valid.

Overall, the findings of the present study provide strong empirical support for multidimensional theories of the digital divide. The results demonstrate that educational inequality in the digital era cannot be reduced solely to issues of technological infrastructure. Instead, educational quality is shaped by the interaction among technological access, digital literacy, geographical context, and institutional conditions. These findings are particularly important for educational policy-making in developing countries because they indicate that effective reduction of educational inequality requires simultaneous investment in technological infrastructure, internet quality, digital literacy training, and institutional support systems.

The present study had several limitations that should be considered when interpreting the findings. First, the study was conducted only among male upper secondary school students in Marvdasht County; therefore, caution should be exercised in generalizing the findings to female students, other educational levels, or other geographical regions. Second, the study relied on self-report questionnaires, which may be influenced by response biases such as social desirability or inaccurate self-evaluation. Third, the cross-sectional design of the study limits the possibility of establishing definitive causal relationships among the variables. Finally, some potentially influential variables, including socioeconomic status, parental educational background, school resources, and teachers' digital competencies, were not included in the structural model.

Future studies are recommended to examine the relationships among digital access, digital literacy, and educational quality in broader and more diverse populations, including female students and different educational levels. Longitudinal and experimental research designs could provide stronger evidence regarding the causal relationships among the variables. Researchers are also encouraged to investigate the role of additional mediating and moderating variables such as socioeconomic status, parental support, school technological readiness, teacher digital competence, and psychological variables related to motivation and self-regulated learning. Comparative studies across different provinces and countries may also contribute to a deeper understanding of contextual and cultural differences in digital inequality and educational outcomes.

Educational policy-makers should prioritize the development of technological infrastructure in rural and underserved areas, particularly by improving internet stability and accessibility. Simultaneously, comprehensive digital literacy programs should be implemented for students and teachers to ensure effective utilization of educational technologies. Schools should be equipped with adequate digital learning resources and supported through continuous technological maintenance and teacher training initiatives. Furthermore, educational institutions should adopt targeted intervention programs designed specifically for disadvantaged students in order to reduce educational

Iranian Journal of Educational Sociology
E-ISSN: 2645-3460

inequalities and promote digital justice within the educational system.

Authors' Contributions

Authors equally contributed to this article.

Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

Transparency Statement

Data are available for research purposes upon reasonable request to the corresponding author.

Acknowledgments

We hereby thank all participants for agreeing to record the interview and participate in the research.

Declaration of Interest

The authors report no conflict of interest.

Funding

According to the authors, this article has no financial support.

Ethical Considerations

All procedures performed in studies involving human participants were under the ethical standards of the institutional and, or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

References

Abbasi Kasbi, H. (2021). An indigenous model for reducing the digital divide in Iran: A case study of villages in Qom Province. *Rural Research*, *12*(3), 45-68.

Alexiou, A. (2022). Digital gaps influencing the online learning of rural students in secondary education: A systematic review. *International Journal of Educational Research*, *115*, 102-118.

Alizadeh, H., Rahimi, M., & Hosseini, F. (2023). Factors affecting the digital divide in Iran's provinces. *Journal of Economic and Social Sciences*, *22*(4), 45-72.

Assefa, Y., Gebremeskel, M. M., Moges, B. T., Tilwani, S. A., & Azmera, Y. A. (2025). Rethinking the digital divide and associated educational in(equity) in higher education in the context of developing countries: The social justice perspective. *International Journal of Information and Learning Technology*, *42*(1), 15-32. https://doi.org/10.1108/IJILT-03-2024-0058

Astari, A., & Yulianto, D. (2025). Bridging the digital divide in education: Disparities in Google Classroom utilization and technical challenges among urban and rural teachers. *Journal of Educational Technology*, *9*(2). https://doi.org/10.23887/jet.v9i2.92897

Chaubi, J., Udui, E., & Rechab, D. (2025). A critical evaluation of a government-sponsored hybrid learning program for bridging the digital divide in remote eastern Indonesia. *Journal of Educational Technology & Society*, *28*(1), 45-62.

Cheng, Y., Zhang, M., & Chen, S. (2023). Development and validation of internet literacy scale for high school students. *Education and Information Technologies*, *28*(8), 1-28.

Di Pietro, G., & Castano-Munoz, J. (2025). A meta-analysis on the effect of technology on the achievement of less advantaged students. *Computers & Education*, *226*, 105197. https://doi.org/10.1016/j.compedu.2024.105197

Ebrahimi Sirizi, P., Rouhani, A., Afrasiyabi, H., & Farahmand, M. (2025). The problem of educational dropout in Iran: A meta-synthesis study. *Journal of Social Issues of Iran*, *16*(1), 83-120.

Fang, X., Xu, H. X., & Ng, T. K. (2025). Exploring the influence of sociodemographic and socioeconomic factors on the digital divide in higher education. *Education Sciences*, *15*(12), 1690. https://doi.org/10.3390/educsci15121690

Ghasemi, M. (2023). Challenges of virtual education for elementary students in rural areas. *Journal of Research in Curriculum Planning*, *19*(36), 55-78.

Gohain, J., & Konwar, N. (2025). Education for all in the digital age: Bridging the divide. Proceedings of the International Conference on Smart Systems and Social Management (ICSSSM 2025),

Hassler, B., Huntington, B., Klune, C., Lester, J., Bhutoria, A., & Mansour, H. (2025). *Understanding quality characteristics of EdTech interventions and implementation for disadvantaged pupils: Systematic review with meta-analysis*.

Karimi, S., Mohammadi, R., & Ghasemi, M. (2024). Determinants of the digital outcome divide in e-learning between rural and urban students. *Journal of Educational Technology*, *18*(2), 89-112.

Kour, H., & Mirza, T. (2026). Bridging the digital divide: Exploring teachers' perspectives on challenges and barriers to ICT integration in rural schools of Jammu Division, J&K. *Indian Journal of Educational Technology*, *8*(1), 361-383.

Li, F., Cheng, L., Wang, X., Shen, L., Ma, Y., & Islam, A. Y. M. A. (2025). The causal relationship between digital literacy and students' academic achievement: A meta-analysis. *Humanities and Social Sciences Communications*, *12*(1), 108. https://doi.org/10.1057/s41599-025-04399-6

Malarvizhi, J., & Geetha, K. (2025). Digital literacy in mathematics among secondary school students: Gender and regional differences. *Acta Scientiae*, *26*(3), 300-306.

Mathrani, A., Umer, R., Sarvesh, T., & Adhikari, J. (2023). Rural-urban, gender, and digital divides during the COVID-19 lockdown: A multi-layered study. *Societies*, *13*(5), 112. https://doi.org/10.3390/soc13050112

Mirzaei, F. (2025). Investigating the digital divide between urban and rural students in Iran's educational system. *Biannual Journal of Curriculum Studies*, *18*(34), 87-104.

Mohammadpour, A. (2024). Investigating the dimensions of the educational gap between urban and rural areas with a focus on access to technology. *Journal of Sociology of Education*, *19*(1), 55-77.

Naseri, S. (2025, 2025-05-15). Village teachers and students in the battle against weak antennas. *Islamic Republic News Agency*.

Iranian Journal of Educational Sociology
E-ISSN: 2645-3460

Ngoveni, A. (2025). Willing but underserved: Interpreting digital training needs of grade 8-12 teachers in a rural Libangeni circuit. *Education Sciences*, *15*(11), 1557. https://doi.org/10.3390/educsci15111557

Oecd. (2023). *PISA 2022 Assessment and Analytical Framework*.

Rezaei, M., Saadat, A., & Jafari, P. (2023). Analysis of the rural digital literacy policy-making system in Iran. *Journal of Rural Development Studies*, *10*(4), 121-144.

Salem, A., Ahmadi, S., & Karimi, N. (2024). Factors affecting the digital divide in Iran's provinces. *Journal of Economic and Social Sciences*, *22*(4), 45-72.

Shafiei, S., Ahmadi, M., & Karimi, N. (2023). A systematic review of digital gaps affecting rural secondary students' online learning. *Journal of Research in Curriculum Planning*, *20*(37), 45-67.

Tan, S., & Chen, P. (2022). Determinants of the digital outcome divide in e-learning between rural and urban students: Empirical evidence from the COVID-19 pandemic based on capital theory. *Computers & Education*, *178*, 104118.

Tang, Q., Kamarudin, S., Abdul Rahman, S. N., & Zhang, X. (2025). Bridging gaps in online learning: A systematic literature review on the digital divide. *Journal of Education and Learning*, *14*(1), 161-176. https://doi.org/10.5539/jel.v14n1p161

Vaziri, M. (2025). A sociological analysis of the digital divide and its impact on educational quality across different regions of Iran. *Journal of Social Sciences, Shiraz University*, *31*(2), 133-158.

Yousefi, M. (2025). Digital justice and equal access to educational technologies in rural areas of Iran. *Journal of Rural Education and Development*, *7*(1), 23-45.

Yu, J., Wang, L., & Liu, S. (2025). The causal relationship between digital literacy and students' academic achievement: A meta-analysis. *Humanities and Social Sciences Communications*, *12*, 108. https://doi.org/10.1057/s41599-025-04399-6

E-ISSN: 2645-3460