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RESEARCH ARTICLE

Exploring the Disparity in Digital Media Literacy Between Urban and Rural Primary School Students: Insights from an Empirical Study in China

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Abstract With the advent of the digital age, cultivating students' digital media literacy has become an important educational mission. A standardized digital media literacy scale was developed to study the digital media literacy of primary school students in urban and rural areas. Through stratified random sampling, a total of 2,848 urban and rural primary school students participated in this research. Primary school students exhibited moderate proficiency in digital media literacy, with a notable deficiency in their ability to create and disseminate information effectively. Subsequent investigations revealed disparities in the level of digital media literacy between urban and rural students, which appeared in their proficiency to access and use digital tools, as well as their ability to understand and evaluate media messages. Parental education, parental mediation, and time spent using digital devices all have a substantial positive influence on students' digital media literacy, with parental mediation having the greatest impact. Consequently, it is imperative to prioritize the development of higher-order digital media literacy skills in students. Efforts should also be directed toward enhancing the basic digital media literacy of rural primary school students while fostering parental engagement in students' digital education. In this regard, the Chinese government, enterprises, and schools have launched measures to promote rural students' digital media literacy and parents' involvement in students' digital education. Future research should prioritize investigations of the efficacy of these measures to ascertain their impact on the holistic development of digital media literacy among all students.

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1 Introduction

Information and communications technology (ICT), particularly generative artificial intelligence as represented by ChatGPT, has achieved rapid progress in recent years. It has been increasingly used in education by providing and expanding learning spaces, venues, and tools (Lai et al., 2017), which has accelerated the digitalization of education (Yuan, 2022). Developing students' digital media literacy is at the forefront of the process (Liu & Cen, 2023). As a part of a digitalizing and lifelong learning society, students must master digital technologies, which will help them be qualified digital citizens (Li et al., 2023b). Using digital media for various aspects of life, including leisure, entertainment, and work, has become indispensable in daily life. Analyzing, understanding, and interpreting the content conveyed by digital media, as well as creating and generating information, are essential competencies for processing and managing the flow of information (Pereira & Moura, 2019). Studies have shown that the younger generation possesses a relatively limited level of digital media literacy, which is characterized by lower technical and cognitive proficiency (He & Wu, 2015). Differences in geography, socio-economic background, and culture, among other aspects, lead to imbalances in the access to and application of digital media resources, which in turn generate uneven development of digital media literacy. With teenagers comprising a significant portion of internet users in China, the K-12 education

system is facing challenges due to the imbalance of digital resources, which has led to disparities in digital media literacy (Li & Ranieri, 2010). Studies have reported great variations in digital media literacy between urban and rural teachers (Liu et al., 2023), and there may also be a gap in digital media literacy between urban and rural students (Li & Wu, 2023). Compared with the differences in access to technological equipment and the internet, differences in the capacity to utilize digital technology and to benefit from digital media literacy have been recognized as a higher-level digital divide (Corkin et al., 2022) and may create new educational inequities.

China is now pushing ahead with the digitalization of education while also trying hard, simultaneously, to bridge the regional, urban–rural, and inter-school gap (Ministry of Education of the People's Republic of China (MOE), 2018). This initiative has paved the way for the establishment and implementation of Smart Education of China, the national smart education platform catering to primary and secondary schools, replete with a wealth of educational resources and high-quality online courses designed to foster personalized and lifelong learning for Chinese students. Building on the *Digital literacy of teachers* (MOE, 2022) released in November 2022, two more national documents on the digitalization of education and urban–rural integration were released in 2023 (General Offices of the CPC Central Committee & General Offices of the State Council, 2023; MOE, 2023), which made it clear that it is crucial to strengthen the training in digital applications for teachers and students to improve their digital media literacy and practical application skills. Many countries around the world—not just China—have begun to recognize the serious challenges the digital divide may pose to educational equity. Cultivating comprehensive digital media literacy among all citizens is vital to ensuring their adaptability to the digital era's requisites, thereby achieving a more equitable education environment. This measure stands as a cornerstone strategy in narrowing the digital divide and fostering educational equality. The United States (US), the European Union, Singapore, and other developed countries have already launched relevant measures to cultivate national digital media literacy, but so far no effective strategy has been found (Li & Wu, 2023).

Through a nationwide survey on the development of primary school students' digital media literacy, this study provides an in-depth understanding of the disparities between urban and rural students' levels of digital media literacy and their influencing factors. These findings form a foundation for promoting education digitization and ensuring the quality and balanced development of basic education.

2 Literature Review

To contextualize and demonstrate the significance of this study, this section reviews the key literature on the definition of digital media literacy, the urban–rural gap in digital media literacy, and the influencing factors that contribute to this gap.

2.1 | Defining Digital Media Literacy

With the proliferation of media messages and the development of digital technology, the concepts of media literacy, digital literacy, and ICT literacy have been proposed. These concepts relate to an individual's awareness of digital media, their understanding of media messages, and the use of information technology. However, these concepts are used in different fields of research. For example, the concept of media literacy often appears in the study of journalism and media, while digital and ICT literacy appears more often in the field of library and information science. This study therefore introduces a more comprehensive conceptualization of digital media literacy—based on the existing meanings of media, digital, and ICT literacy—that is more applicable to the field of education.

The concept of digital media literacy originated in media literacy, which Aufderheide (1993) identified as helping people understand, produce, and negotiate meanings in a culture of powerful images, words, and sounds. In the National Leadership Conference on Media Literacy, some US researchers agreed that media literacy was the ability to access, analyze, evaluate, and communicate messages in a variety of forms (Christ & Potter, 2006; Livingstone, 2004). The UK media regulator Ofcom defined media literacy as the ability to access, understand, and create communication in a variety of contexts, which was an adaptation of an earlier US definition (Buckingham, 2007). The European Commission also provided an intuitive definition of media literacy as the ability to access the media, to understand and critically evaluate different aspects of the media and media content, and to create communications in a variety of contexts (Koltay, 2011). Early conceptualizations of media literacy focused exclusively on media messages but later came to include the media itself. The definition of media literacy has thus evolved from understanding and assessing to accessing, understanding, evaluating, and even creating. In conclusion, media literacy refers to the ability to access, understand, evaluate, and create media and media messages.

Due to the rapid development of digital media and information technology, two other concepts related to digital media literacy—digital literacy and ICT

literacy—have been increasingly mentioned in the field of library and information science. The concept of digital literacy was first introduced by Paul Gilster (Gilster, 1997), who identified the digitally literate student as having a specific set of information skills such as evaluating and searching (Meyers et al., 2013). Martin (2006) defined digital literacy as the awareness, attitude, and ability of individuals to appropriately use digital tools and facilities to identify, access, manage, integrate, evaluate, analyze, and synthesize digital resources; construct new knowledge, create media expressions, and communicate with others. In a discussion of digital literacy, Meyers et al. (2013) highlighted issues such as cognitive authority, safety and privacy, creativity, ethics, and the responsible use and reuse of digital media. It thus appears that digital literacy focuses on an individual's information skills, digital awareness, digital attitudes, and digital competence.

According to the Educational Testing Service (2002), ICT literacy involves using digital technology, communications tools, and/or networks to access, manage, integrate, evaluate, and create information to function in a knowledge society. According to Claro et al. (2013), ICT literacy is the ability to solve information, communication, and knowledge problems in a digital environment. It thus appears that, like digital literacy, ICT literacy is concerned with topics such as using digital technology and solving information problems. Taken together, both digital literacy and ICT literacy focus on technical or operational aspects, emphasizing access to and use of digital resources such as information. In addition, both concepts are increasingly concerned with topics such as security, privacy, and ethics (Cao & Chu, 2023; Liu et al., 2023).

Based on this summary, digital media literacy has been proposed as an aggregated concept. Hobbs (2010) defined digital and media literacy as a constellation of the life skills necessary for full participation in our media-saturated and information-rich society. These skills include the ability to make responsible choices and access information, analyze messages in a variety of forms, create content in a variety of forms, reflect on one's own conduct and communication behavior, and take social action. He also suggested five essential competencies for digital and media literacy: access, analyze and evaluate, create, reflect, and act. Park (2012) provided a detailed description of the three dimensions of digital media literacy: access, understand, and create—at both the device and content levels. He also emphasized the need for a more positive concept of digital media literacy—learning not only to read and understand media messages but also to create and participate. Kahne et al. (2012) confirmed that digital media literacy was a way to promote online forms of civic and political engagement. According to Park et al. (2015), digital media literacy referred to the effective use of digital networks, services, and tools, while Zhang and Zhu (2016) proposed that digital media literacy was a set of competencies or skills. They developed a conceptual framework encompassing four levels: technical skills, critical understanding, creation and communication, and citizenship participation.

Previous research indicates that the concept of digital media literacy shows the following two salient features: First, digital media literacy, as a comprehensive concept, includes awareness, understanding, and evaluation of digital media tools and media messages, while emphasizing access to and creation of digital resources, as well as involving communication and participation in digital environments; second, it has been suggested that digital media literacy can help students live better in the digital age, assisting their overall development and core literacy enhancement. Overall, digital media literacy can be considered as a concept that is more applicable to the field of education and compatible with the development of the digital age.

2.2 | Urban–Rural Gap in Digital Media Literacy

Several studies have explored the urban–rural gap in media literacy, digital literacy, and ICT literacy. The groups involved in these studies span a wide age range, including adolescents (Chen, 2014; Liu & Li, 2023; Pereira et al., 2019; Zheng, 2015), young adults (Hou et al., 2019; Hu & Jiao, 2022; Ma, 2018), and the elderly (Yu et al., 2023). The primary focus of such research in the field of education has been on teachers (Li et al., 2021a; Zhang & Guo, 2023) and students (Gao & Zhu, 2013; Li et al., 2023b).

Several key conclusions have been drawn regarding the urban–rural gap in digital media literacy among adolescents. Overall, urban students have higher levels of digital media literacy than rural students, as reflected in media exposure and use. Due to the differences in the geographic location and digital environment between urban and rural areas (Li et al., 2022; Qiu & Liu, 2023), urban students have more digital devices and much greater access to digital media than rural students do, and urban students also tend to have access to the internet earlier than rural students (Chen, 2014; Zheng, 2015). There are also differences between urban and rural youths in their media usage habits. Based on a questionnaire survey of minors aged 7 to 18 in urban and rural areas in 10 provinces and cities in China, Liu and Li (2023) found that urban and rural minors tended to be pan-entertained in their internet use and that they both tended to access video-type content. Urban minors are more enthusiastic about long videos, while rural minors favor short videos.

There has been much discussion of information discernment and media critique among urban and rural students, but the findings are inconclusive. Urban and rural adolescents do, however, appear to lack a critical understanding of the media. For example, Lu (2007) found no significant difference between urban and rural adolescents' perceptions of media, while Lariscy (2010) argued that adolescents did not differentiate between sources of information when evaluating information. At the same time, other studies have found that there is a certain difference between urban and rural adolescents' perceptions of mass media and that urban adolescents are more discriminating and media-critical than rural adolescents (Chen, 2014; Zhang & Cheng, 2009).

Some researchers have also investigated media attitudes and influences among urban and rural adolescents, and both urban and rural adolescents have been found to be keen to participate in media activities (Lu et al., 2007). Rural primary school students show more curiosity than urban primary school students (Zhang & Cheng, 2009), and due to the scarcity of resources, digital media tend to be more important to rural adolescents than urban adolescents (Liu & Li, 2023). Liu and Li (2023) also found that rural minors had more prominent online safety and consumption problems, such as using their living expenses for recharging games and tipping while live-streaming.

In short, previous studies have found an urban–rural digital media literacy gap among adolescents, in studies with participant age ranges of 7–18 years old (Liu & Li, 2023), 12–16 years old (Pereira et al., 2019), and 13–25 years old (Chen, 2014). Research on digital media literacy among adolescents has thus spanned a wide range of ages, but fewer studies have been conducted specifically on primary school students. Current studies also have not reached uniform conclusions about urban and rural students' identification and critical understanding of media messages, and fewer studies have addressed students' media creativity and security ethics. This study therefore explored this issue with primary school students.

2.3 | Factors Influencing the Urban–Rural Gap in Digital Media Literacy

Researchers have explored the factors influencing middle school students' digital media literacy at multiple levels: individual, family, and school. At the individual level, it was found that students' individual characteristics such as gender, grade level, ethnicity, information technology self-efficacy, information technology attitudes, and information technology use behaviors were important factors influencing their digital media literacy (Yang et al., 2018). At the family level, Yu et al. (2022) found that the level of information literacy among students with home internet access was significantly higher than that of students without such access. In addition, the father's education had a positive effect on the level of junior high school students' information literacy—the higher the father's education, the higher the students' information literacy. At the school level, digital resources and institutional safeguards can significantly affect students' information literacy. The richer the school's digital resources and the better the institutional safeguards institutions emphasize, the higher the information literacy students will be (San et al., 2018). On this basis, Jiang et al. (2020) explored the relationship between the key factors affecting information literacy among secondary school students and their mediating mechanism. Their findings revealed that there was a chain mediating effect between information technology self-efficacy, information technology attitudes, information technology use behaviors, and secondary school students' information literacy. There were also significant differences in the digital literacy proficiency of junior high school students across the eastern, central, and western regions of China (Song et al., 2023), which indicated that region could be a factor influencing digital literacy levels.

A few studies have also tentatively explored the factors that contribute to the gap between urban and rural students' digital media literacy. These factors can be broadly categorized into macro, meso, and micro levels. First, at the macro level, some researchers have pointed out that economic and political factors have led to the urban–rural information divide in China, and policy is the most powerful solution (Yang & Zhang, 2020). Second, at the meso level, network conditions are important factors that contribute to students' attitudes toward online learning (Zhao et al., 2021). Finally, at the micro level, an individual's age, gender, media exposure and use, family's digital environment, parents' education, and parents' mediation may be factors that contribute to the digital media literacy of students in urban and rural areas (Lemphane & Prinsloo, 2014; Lund & Wang, 2022; Pereira et al., 2019; Zheng, 2015). The micro-level factors that contribute to the digital media literacy gap between urban and rural students are complex. This study focuses on exploring individual and family factors to provide practical recommendations to improve students' digital media literacy. Multiple studies have revealed that students' digital media literacy plays a crucial role in their academic achievement and competency. For example, Zhao et al. (2020) found that adolescents' interest in ICT and self-perception of ICT competence positively affected their academic performance, while Li et al. (2021a) also discovered that both attitudes toward ICT and ICT competence had a significant positive impact on reading ability. It is therefore highly important to identify the factors that influence digital media literacy,

improve students' digital media literacy in a targeted manner, and empower them to effectively tackle the challenges posed by an increasingly digital society during the crucial digital transformation phase in China.

2.4 | Present Study

Previous studies have focused on the concepts of media literacy, digital literacy, and ICT literacy. They have analyzed the literacy levels of urban and rural adolescents comparatively, finding that the overall literacy levels of urban adolescents are higher than those of rural adolescents. However, the differences in terms of the dimensions of these literacy levels have not yet led to a consistent conclusion. In addition, the literacy of urban and rural adolescents is also influenced by macro factors such as economic, political, and network conditions, as well as micro factors such as parental education, parental mediation, and individual media use. With the development of information technology, children are exposed to media at an ever earlier age, and their digital media literacy plays an extremely important role in their future growth and development. However, there is still a lack of specialized research on the digital media literacy of primary school students.

Therefore, based on the concept of digital media literacy proposed by Zhang and Zhu (2016), in this study, we define digital media literacy as the capacity to use digital devices to access and critically evaluate media information, and express one's own views, while complying with safety and ethical guidelines. This study focused on the comprehensive concept of digital media literacy and analyzed the overall digital media literacy performance of urban and rural primary school students based on a survey of primary school students in China. The performance of these students was then compared in terms of four aspects: access and use, understanding and evaluation, creation and dissemination, and security and ethics. The influencing factors that contributed to the gap in students' digital media literacy at both the individual and family micro levels were then explored in depth. Based on previous studies, this study proposed the following research questions and formed a theoretical structural research model (shown in Figure 1).

Q1: What are the urban–rural disparities in digital media literacy among primary school students in China?

Q2: To what extent do family (parental education and parental mediation) and individual (time spent using digital media) factors contribute to the digital media literacy gap between urban and rural primary school students?

3 Method

3.1 | Participants

A stratified random sampling method was adopted in this study. Participants were fifth and sixth graders from urban and rural primary schools. We contacted the teaching staff at these schools to elicit their help in announcing the research project to students. An online survey was used, and participants were required to complete the survey after school. After deleting incomplete survey responses, 2,848 valid survey responses were included. Of the participants, 1,474 (52%) were female and 1,374 (48%) were male; 1,489 (52%) were fifth graders and 1,359 (48%) were sixth graders. Urban students account for 68% of respondents and rural students, 32%, which is in line with the urban–rural population distribution in China. Around half of the respondents (49%) reported using digital media devices for between zero to one hour per day. We also set up six options to measure parental education: primary school, junior high school, senior high school, junior college, undergraduate, and master's and above; the values 1–6 were assigned to these options, respectively. (See Table 1 for the profiles of participants.)

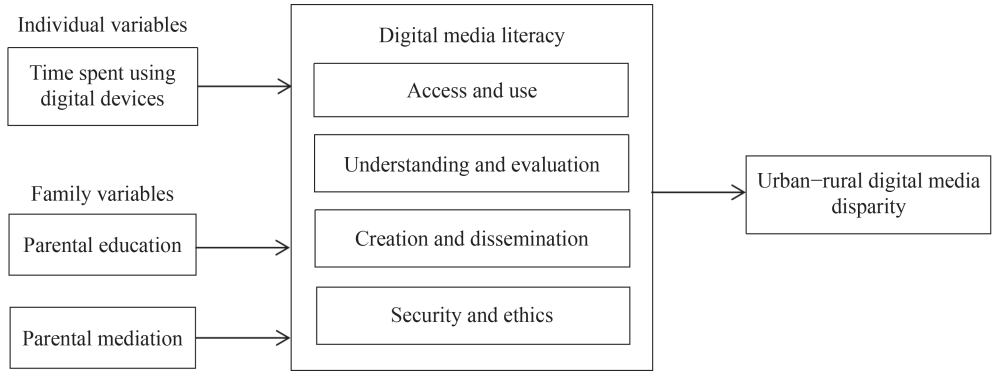

Figure 1 Theoretical structural research model.

Table 1 Participants demographic profile (N = 2,848)

Participants' demographic information	Options	Numbers	Proportion in the sample (%)
Gender	Male	1,474	52
	Female	1,374	48
Grade	5th	1,489	52
	6th	1,359	48
Geographic location	Urban area	1,951	68
	Rural area	897	32
Father's education	Primary school	191	6
	Junior high school	1,048	37
	Senior high school	792	28
	Junior college	390	14
	Undergraduate	353	12
	Master's and above	74	3
Mother's education	Primary school	218	8
	Junior high school	1,062	37
	Senior high school	763	27
	Junior college	406	14
	Undergraduate	346	12
	Master's and above	53	2
Time spent using digital media per day (t)	0 h	193	7
	$0 < t < 1$ h	1,399	49
	$1 \leqslant t < 2$ h	1,072	37
	$2 \leqslant t < 3$ h	133	5
	$\geqslant 3$ h	51	2

3.2 | Instruments

The survey questionnaire consisted of 44 question items, divided into four sections. Participants were invited to rate their agreement with each item on a 5-point Likert scale (except in the case of demographic information), ranging from 1, "strongly disagree", to 5, "strongly agree". The first section gathered demographic information about the students, such as gender, age, and geographic location. The second section measured students' home internet access and daily experiences with digital media devices, focusing on students' digital media use. This section contained three question items. The third section included eight question items adapted from Wu et al. (2019) to examine parental mediation of students' usage of digital technology and media. The fourth section was a digital media literacy scale. According to the four-dimensional model of digital media literacy previously proposed as shown in Figure 1 (i.e., access and use, understanding and evaluation, creation and dissemination, and security and ethics), a list of initial items related to digital media literacy was established through group discussion. Previous scales (OECD, 2017; Zhang & Zhu, 2016) were also inspected to determine if they had adaptable questionnaire items. To ensure that the items were appropriately worded, eight experts (two experts on digital media literacy education and six primary school teachers) and 10 students were invited to review the scale and make suggestions to ensure that the items were as clear, concise, and logical as possible. The revised scale consisted of 18 question items under four constructs, with Cronbach's α employed to assess its reliability, wherein α denotes a reliability coefficient. Specifically, four question items on access and use (α = 0.71) assessed the ability to find information and obtain it in the digital environment (see Table 2 for the implication and sample items). Six question items on understanding and evaluation (α = 0.81) assessed the ability to analyze the information obtained critically. Four question items on creation and dissemination (α = 0.78) assessed the ability to communicate and disseminate information through digital technology. Four question items on security and ethics (α = 0.66) assessed the ability to use digital media technologies risk-free and ethically.

3.3 | Data Analysis

First, to confirm the measurement properties of the instruments, both exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were conducted using SPSS 25.0 and AMOS 22.0 softwares. Second, we conducted a descriptive analysis to report on the overall level of digital media literacy among primary school students. Third, a t-test was performed to examine the differences between urban and rural students in terms

Table 2 Dimension, definition, and sample item in digital media literacy scale

Dimension	Definition	Sample item
Access and use	Ability to find information and obtain it in the digital environment	I can download and install software using my phone or computer.
Understanding and evaluation	Ability to analyze the information obtained critically	I can judge the reliability of information and news on the internet.
Creation and dissemination	Ability to communicate and disseminate information through digital technology	I can produce pictures, videos, audio, or other content and post it on the internet.
Security and ethics	Ability to use digital media technologies risk-free and ethically	I can protect my personal information from being revealed (e.g., not telling strangers my login password for social software).

of digital media literacy. Fourth, another *t*-test was conducted to examine the difference between the possible influencing factors on digital media literacy, such as individual media use, parental education, and mediation. Fifth, structural equation modeling (SEM) was conducted to examine the impacts of the possible influencing factors on students' digital media literacy.

4 Results

4.1 | Common Method Bias

Common method bias (CMB) was examined to determine whether there was any artificial covariation between predictor and validity variables caused by similarities in data sources, measurement environments, or item contexts. The results showed that there were six factors with eigenvalues greater than 1, and the variance interpretation of the largest factor was 23.06%, which indicated no significant CMB in this study, according to the guidelines of Podsakoff et al. (2003).

4.2 | Validity and Reliability of the Digital Media Literacy Scale

A sample of 488 fourth and fifth graders from a primary school in Central China were invited to test the validity and reliability of the digital media literacy scale (18 items). After the screening, 469 questionnaires were accepted as valid, among which 46.9% were fourth graders and 53.1% were fifth graders, 249 (53%) were males and 220 (47%) were females. Both EFA and CFA were conducted to address the construct validity of the digital media literacy scale. We divided the valid data randomly into two parts, one for EFA using SPSS 25.0 software and the other for CFA using AMOS 22.0 software.

EFA was conducted to test the underlying structure of the digital media literacy scale with the first part of the data (n = 148). Here n is equal to the number of valid questionnaires. Prior to EFA, the Kaiser–Meyer–Olkin (KMO) test and Bartlett's test of sphericity were conducted to measure the sampling adequacy and factorability of the data. The Bartlett's sphericity test statistics were significant ($p < 0.001$) and the KMO value was 0.805, which indicated that there were common factors among the correlation matrices of the data, and the questionnaire was suitable for EFA (Hooper, 2012). Four factors were extracted based on EFA according to the standard with an eigenvalue greater than 1 (Kaiser, 1958). The total variance of the cumulative interpretation was 58.32%. This indicated that four dimensions of the questionnaire could explain the information in the original variables to a large extent. Table 3 summarizes the EFA results of the digital media literacy scale. The reliability of each scale was analyzed by internal consistency estimation of Cronbach's α. Except for dimension 4, for which Cronbach's α was slightly less than 0.7, Cronbach's α scores on the other three dimensions were greater than 0.7, which indicated the scale had satisfactory internal reliability.

Table 3 Results of the exploratory factor analysis of the digital media literacy scales

Dimensions and question items	Rotated factor loading	Eigenvalue	Cronbach's α
Access and use		2.15	0.71
Q1	0.65		
Q2	0.75		
Q3	0.63		
Q4	0.64		
Understanding and evaluation		3.33	0.81
Q5	0.53		
Q6	0.70		
Q7	0.77		
Q8	0.74		
Q9	0.73		
Q10	0.65		
Creation and dissemination		2.94	0.78
Q11	0.68		
Q12	0.73		
Q13	0.79		
Q14	0.76		
Security and ethics		2.08	0.66
Q15	0.77		
Q16	0.64		
Q17	0.57		
Q18	0.61		

CFA was conducted using the second part of the data (n = 321) to verify whether the factor constructs fit our sample and to test the four-dimensional model fitting of primary school students' digital media literacy. The model was composed of access and use, understanding and evaluation, creation and dissemination, and security and ethics (see Figure 2). A variety of goodness-of-fit statistics were used as indices for model evaluation, including the CMIN/df denoting the minimum discrepancy, root mean square error of approximation (RMSEA), goodness of fit index (GFI), adjusted GFI (AGFI), comparative fit index (CFI), incremental fit index (IFI), and the Tucker–Lewis index (TLI). CMIN/df less than 3.0 indicates an acceptable fit (Hair et al., 1995). RMSEA

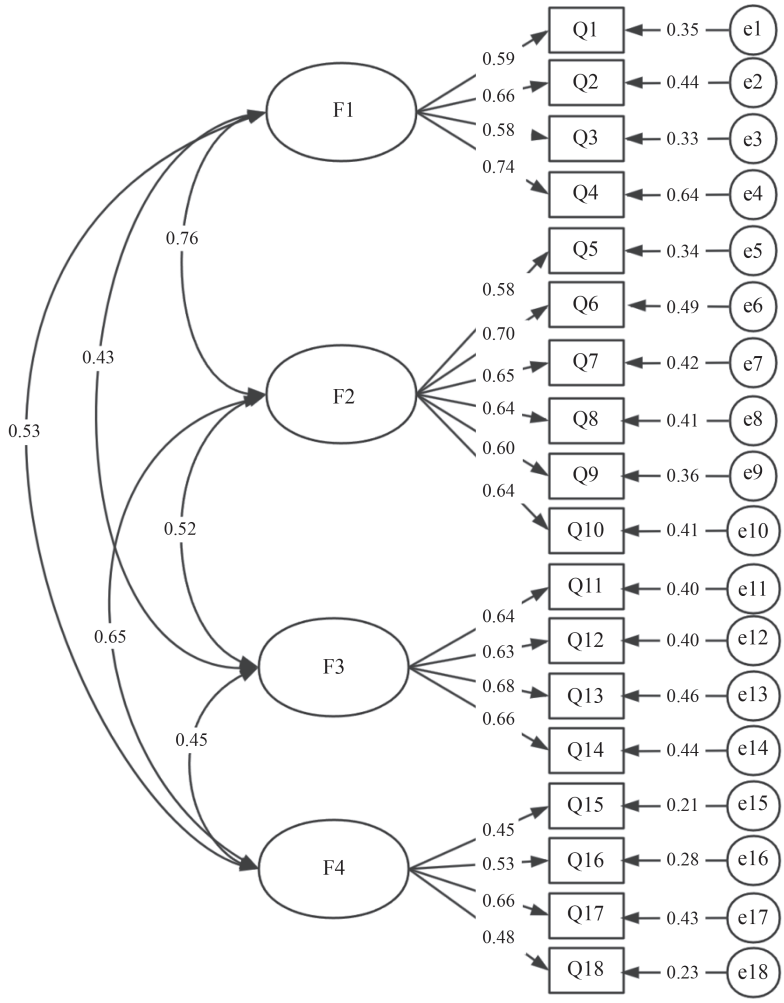

Figure 2 Four-dimensional model of digital media literacy. F1 = access and use, F2 = understanding and evaluation, F3 = creation and dissemination, F4 = security and ethics.

from 0.05 to 0.08 indicates adequate fit, while values from 0 to 0.05 indicate excellent fit. GFI, AGFI, CFI, IFI, and TLI from 0.80 to 0.90 indicate acceptable fit, while values from 0.90 to 1.00 indicate excellent fit (Gefen et al., 2000; Hair et al., 1995). The fit indices were satisfactory for all of the CFA models (see Table 4). In addition, the *p* value represents the possibility that the results are attribute to chance. The smaller the *p* value, the more robust the evidence suggests. Notably, all loadings were significant at $p < 0.001$, and the majority of factor loadings were higher than 0.60.

Table 4 Results of the confirmatory factor analysis of the digital media literacy scales

Fit indice	CMIN/d*f*	RMSEA	GFI	AGFI	CFI	IFI	TLI
Fitting values	2.32	0.06	0.91	0.88	0.89	0.89	0.87
Suggested values	< 3.00	< 0.08	> 0.80	> 0.80	> 0.80	> 0.80	> 0.80

Notes. RMSEA = root mean square error of approximation, GFI = goodness of fit index, AGFI = adjusted GFI, CFI = comparative fit index, IFI = incremental fit index, TLI = the Tucker–Lewis index.

4.3 | Descriptive Results and Differences in Digital Media Literacy among Primary School Students

The results for the descriptive statistics showed that the average digital media literacy score was 68.71, designated as *M* in Table 5, and the standard deviation score was 12.27 designated as *SD*. According to the participants' reports, primary school students maintained a

Table 5 Descriptive statistics and *t*-tests for digital media literacy

Scale	Total sample		Urban students		Rural students		*t*
	M	*SD*	*M*	*SD*	*M*	*SD*	
AU	65.96	16.59	67.61	16.81	62.36	15.49	8.18***
UE	68.95	14.08	69.68	14.09	67.37	13.92	4.09***
CD	60.63	20.30	60.96	20.42	59.92	20.02	1.28
SE	79.17	15.64	79.28	15.50	78.92	15.95	0.57
DML	68.71	12.27	69.42	12.35	67.17	11.95	4.57***

Notes. DML = digital media literacy, AU = access and use, UE = understanding and evaluation, CD = creation and dissemination, SE = security and ethics; ***$p < 0.001$.

high level of security and ethics (M = 79.17, SD = 15.64) and a low level of creation and dissemination (M = 60.63, SD = 20.30).

A t-test was conducted to test the differences between urban and rural students in digital media literacy where t represented the t value. The results showed that urban students (M = 69.42, SD = 12.35) maintained an overall higher level of digital media literacy than rural students (M = 67.17, SD = 11.95), which suggested that there was indeed a gap between the two. Specifically, significant differences were found in access and use (t = 8.18, p < 0.001) and understanding and evaluation (t = 4.09, p < 0.001), while no significant differences were found for creation and dissemination (t = 1.28, p = 0.201) or security and ethic (t = 0.568, p = 0.570). The results of descriptive statistics and t-tests are shown in Table 5.

The items with significant differences between urban and rural students in the "access and use" and "understanding and evaluation" dimensions are shown in Table 6. Although there were significant differences between urban and rural students' answers to specific questions, the overall score was between 3 and 4 points—that is, from "uncertain" to "relatively agreed" on the scale—which meant that all students had room for improvement in their ability to access information using digital media, understand the information disseminated, and properly evaluate that information. It is worth noting that the average scores of urban and rural students in the use of office software such as Word and PowerPoint is relatively low, which means that these students need to further improve their ability in this area.

4.4 | Differences Between Urban and Rural Students in Individual and Family Factors

A t-test was conducted to compare the differences in individual digital media experience (i.e., time spent using digital devices for study and entertainment), parental education, and mediation between urban and rural students (see Table 7). The results showed that parents of urban students received higher scores on education and mediation, which meant that most urban parents were better educated than their rural counterparts, as well as tending to play a more active role in their children's development. Surprisingly, it was found that rural students spent more time using digital media devices both for study and entertainment than urban students, with significant differences in the use for study. There may be several reasons for this. Previous research has indicated that rural students exhibit a comparatively lower proficiency in evaluating and discerning media information, which necessitates an increased investment of time in searching for enhanced learning resources on the internet. In addition, because rural students have fewer ways to access educational resources, they are more willing to use digital media to acquire knowledge. This phenomenon warrants further exploration in future studies.

4.5 | Influences of Individual and Family Factors on Digital Media Literacy among Urban and Rural Primary Students

Analyses of bivariate correlations between digital media literacy and individual and family factors were computed. As shown in Table 8, dimensions of digital media literacy were positively related to each other. Individual factors (TS & TE) had weak but significant correlations with most dimensions of digital media literacy, except for the insignificant relation between TE and SE. As for family factors, digital media literacy had

Table 6 Items with significant differences between urban and rural students

Scale	Item	Urban students		Rural students		t
		M	SD	M	SD	
AU	I can download and install software using my phone or computer.	3.59	1.257	3.30	1.231	5.725***
	I can utilize communication tools like QQ and WeChat to engage in interpersonal interactions.	3.92	1.211	3.54	1.274	7.468***
	I can use Word, PowerPoint, and other office software.	2.80	2.569	2.39	1.238	4.505***
UE	I possess knowledge regarding the source platforms of internet information.	3.07	1.236	2.91	1.175	3.509***
	I possess the ability to discern and differentiate between various functions of the medium, such as learning, socializing, and entertainment.	3.85	1.106	3.68	1.149	3.719***
	I possess the ability to comprehend the conveyed meaning of news, images, and videos disseminated on the internet.	3.87	1.045	3.72	1.129	3.315***
	I agree that diverse perspectives and content should be presented in media.	3.71	1.045	3.59	1.074	2.882**

Notes. AU = access and use, UE = understanding and evaluation; ***p < 0.001, **p < 0.01.

Table 7 Descriptive statistics and *t*-tests for individual and family factors

Demographic characteristics	Numbers and proportion (%)		*M* (*SD*)		*t*
	Urban participants	Rural participants	Urban participants	Rural participants	
Time spent using digital devices for study (minutes)			29.78 (28.45)	32.25 (30.98)	−2.09*
Time spent using digital devices for entertainment (minutes)			29.04 (38.34)	30.56 (39.60)	−0.97
Parental mediation			78.80 (14.72)	75.56 (15.82)	5.32***
Father's education					
Primary school	71 (3.60)	120 (13.40)			17.25***
Junior high school	579 (29.70)	469 (52.30)			
Senior high school	600 (30.80)	192 (21.40)			
Junior college	329 (16.90)	61 (6.80)			
Undergraduate	302 (15.50)	51 (5.70)			
Master's and above	70 (3.60)	4 (0.40)			
Mother's education					
Primary school	83 (4.30)	135 (15.10)			17.48***
Junior high school	585 (30.00)	477 (53.20)			
Senior high school	588 (30.10)	175 (19.50)			
Junior college	356 (18.20)	50 (5.60)			
Undergraduate	288 (14.80)	58 (6.50)			
Master's and above	51 (2.60)	2 (0.20)			

Notes. *$p < 0.05$, ***$p < 0.001$.

Table 8 Correlations between digital media literacy and individual and family factors

Factors	DML	AU	UE	CD	SE	TS	TE	FE	ME	PM
DML	1									
AU	0.73***	1								
UE	0.83***	0.48***	1							
CD	0.77***	0.45***	0.50***	1						
SE	0.64***	0.30***	0.42***	0.27***	1					
TS	0.09***	0.06**	0.06**	0.08***	0.06**	1				
TE	0.11***	0.10***	0.09***	0.12***	0.00	0.23***	1			
FE	0.08***	0.17***	0.07***	0.01	−0.02	−0.07**	−0.07**	1		
ME	0.04*	0.15***	0.04*	−0.02	−0.05*	−0.08***	−0.08***	0.74***	1	
PM	0.37***	0.22***	0.32***	0.23***	0.34***	−0.01	−0.09***	0.13**	0.10***	1

Notes. DML = digital media literacy, AU = access and use, UE = understanding and evaluation, CD = creation and dissemination, SE = security and ethics, FE = father's education, ME = mother's education, TS = time spent using digital devices for study, TE = time spent using digital devices for entertainment, PM = parental mediation; *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

a relatively strong and positive correlation with parental mediation, as well as a weak but significant correlation with parental education.

SEM was conducted to examine the impacts of individual and family factors on digital media literacy. Each construct was treated as a latent variable, and its items were used as observed variables. The model shown in Figure 3 reported a significant $x^2 = 1610.975$, $p < 0.001$, although the model fit was still considered reasonable based on other indices: RMSEA = 0.074, SRMR = 0.050, CFI = 0.90, TLI = 0.87. This result showed that individual digital media experience, parental education, and parental mediation all positively predicted students' digital media literacy, with parental mediation having the greatest impact and parental education having the weakest impact. The model explained 28.9% of the variance in digital media literacy.

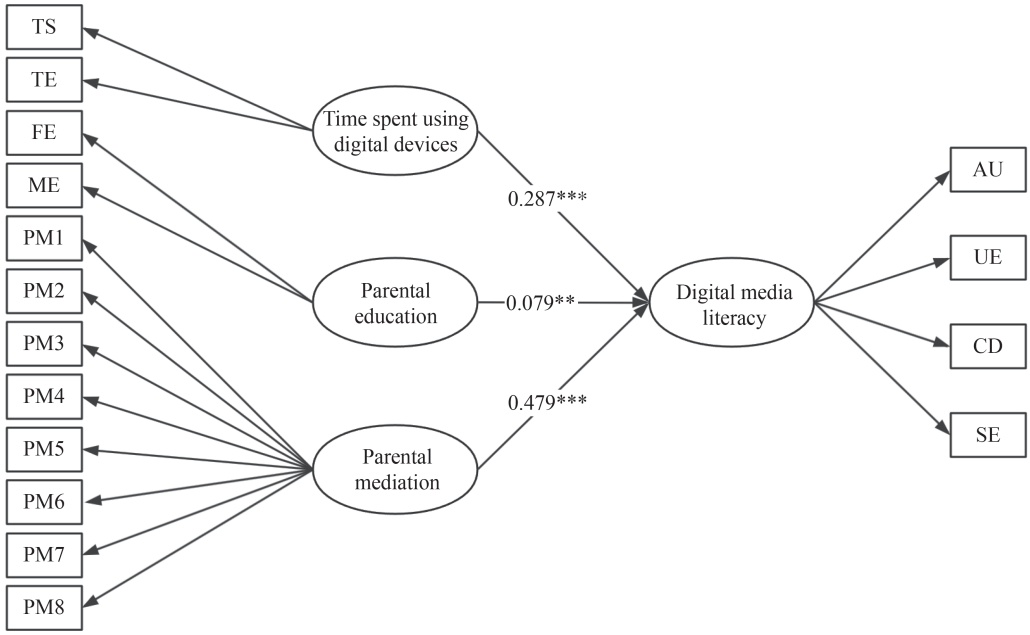

Figure 3 Model of the relationships between individual and family factors and digital media literacy. AU = access and use, UE = understanding and evaluation, CD = creation and dissemination, SE = security and ethics, TS = time spent using digital devices for study, TE = time spent using digital devices for entertainment, FE = father's education, ME = mother's education, PM = parental mediation; $^{**}p < 0.01$, $^{***}p < 0.001$.

5 Discussion

5.1 | Disparity in Digital Media Literacy among Urban and Rural Primary School Students

In the present study, we found that the level of digital media literacy among urban and rural primary school students was average. The mean digital media literacy score of primary school students in China was 68.71, and the percentage of students in the 50–70 score range was about 52%. It can be seen that, on the whole, the level of digital media literacy for all primary school students in China needs to be improved. This finding supports those of previous studies. For example, Yu et al. (2021) found that the mean value of information literacy among primary school students in Grades 4 and 5 was 67.61, which was at an average level. Similarly, Song et al. (2023) found that junior high school students had average levels of digital literacy, with a mean score of 72.83. Pereira and Moura (2019) pointed out that teenagers' media literacy was, for the most part, at the lower level.

In terms of urban–rural disparity, the results showed that urban primary school students scored significantly higher on digital media literacy than rural primary school students did. These results are consistent with those of previous studies (Li & Ranieri, 2013; Li et al., 2022; Liao et al., 2016). For example, Liao et al. (2016) found that urban students scored higher than rural students on digital self-efficacy by 1.337 points. The study by Li et al. (2022) of primary school students in Guangdong province also found that rural primary school students had significantly less ICT literacy than their urban counterparts. Similarly, Kim et al. (2014) found that students who attended schools in areas with relatively high access to information tended to have higher levels of ICT literacy. This indicates that a disparity in digital media literacy between urban and rural students does exist, and it starts as early as primary school.

We also found that the performance of primary school students on the dimensions of digital media literacy was uneven. Primary school students performed well in digital security and ethics, with a score close to 80. They scored average in both access and use as well as understanding and evaluation sections, with scores not exceeding 70. Primary school students' worst performance was in creation and dissemination, with a score just above the passing grade. In terms of the urban–rural gap, urban students performed better than rural students on the foundational dimensions of digital media literacy (i.e., access and use, and understanding and evaluation). Specifically, there are fewer disparities in the fundamental functionalities of using digital media. However, both urban and rural students need further instruction on the proficient use of office software such as Word and PowerPoint. In terms of understanding and evaluating digital media, the main differences were in identifying the sources and functions of media information. Some rural students perceived the comprehension of media information as

challenging, whereas a majority of students concurred that digital media could present information encompassing diverse perspectives.

First, primary school students' digital security and ethics scores are relatively high, which is consistent with the results of previous studies (Song et al., 2023; Yang et al., 2018; Yu et al., 2021; Zhou & Tian, 2021; Zhu et al., 2018). Yu et al. (2021) found that students in the fourth and fifth grades of primary school performed well in the dimension of information society responsibility, with an average score of 76.79%. Similarly, middle school and high school students scored higher on the information ethics and law dimension (Yang et al., 2018; Zhu et al., 2018). He and Wu (2015) pointed out that the vast majority of students were able to perform very ethically using media. Students thus appear to have a high level of digital security awareness and competence, as well as the ability to comply with social ethics and conduct their activities within the boundaries of the law. One possible reason for this is China attaches great importance to the cultivation of students' sense of social responsibility in the information society (Feng & Jiang, 2017; Ma, 2022; Shi, 2020) and has achieved good results.

Second, the two basic dimensions of digital media literacy are "access and use" and "understanding and evaluation." This study assessed students' ability to access media information, use media tools, and critically analyze media information, which were activities that pointed to students' media knowledge, skills, and awareness. Primary school students scored 65.96 on the access and use level and 68.95 on the understanding and evaluation level, which was an average performance. For *access and use*, this finding is consistent with previous research. Song et al. (2023) found that junior high school students scored 68.8% on the dimension of digital knowledge and skills, while Yu et al. (2021) found that primary school students scored 69.71% on the dimension of information knowledge and skills. They all agreed that primary school students were average in accessing information and using digital tools. In terms of *understanding and evaluation*, this finding challenges the results of previous studies. For example, Yu et al. (2021) found that primary school students performed well on the information awareness and attitude dimension, with a score of 75.69%. According to Gui and Argentin (2011), teenagers performed significantly less well in evaluation skills. The reason for this difference was that, in our study, the measure of primary school students' understanding and assessment was biased toward their critical understanding, which resulted in relatively lower scores than in previous research. This indicates that primary school students already have some ability to access, use, understand, and evaluate digital media tools and media messages, but are not sufficiently critical, so there is still room for improvement in their digital media literacy.

In terms of the urban–rural disparity, urban students performed better than rural students on the foundational dimensions of digital media literacy (i.e., access and use, and understanding and evaluation). This finding validates the results of previous research. Guo and Hua (2023) suggested that rural students were not sufficiently aware of the use of information technology or as proficient in the operation of equipment compared to urban students. Li and Ranieri (2013) pointed out that students from rural schools were more likely to report lower levels of digital access and internet use. Similarly, Ma (2018) noted that urban youth had significantly higher skills in media analysis and evaluation than rural youth. Li and Yang (2022) also suggested that urban students were better able to acquire information critically, filter useless information, and process information than rural students. Although the urban–rural gap in information infrastructure and digital resources in primary and secondary schools in China has been narrowing (Chen & Zhi, 2018), this digital divide still exists. One of the manifestations of this is that there is still a significant difference in the levels of basic digital media literacy between urban and rural students. This phenomenon may be due to a variety of reasons, including schools, teachers, and families.

At the school level, although rural schools have a certain amount of information infrastructure, the maintenance costs of information facilities are high, while rural schools lack stable financial security (Duan & Mu, 2016). This results in a low effective utilization rate of the equipment. There is also currently no specialized curriculum for the development of students' digital media literacy in China, and the relevant content may be scattered in courses on Chinese, information technology, morality, and the rule of law. The courses most relevant to students' basic digital media literacy may still be information and technology courses, to which rural schools do not pay sufficient attention (Li & Yang, 2022), which leads to poor results. Rural teachers also tend to have insufficient knowledge and application of information technology and a weak capacity to use it to teach (Duan & Mu, 2016). He and Wu (2015) found that the lack of professional development related to digital media literacy for teachers was one of the main barriers to the development of digital media literacy education at the grassroots level in China. At the family level, the low level of parental education in rural areas has resulted in their lack of attention and ability to develop digital media literacy in their children.

In response to the plight of rural digital education, Tencent, a technology company in China's digital economy, created the "Digital Education Support" program (i.e., the Tencent SSV Digital Volunteer Teaching Laboratory) in 2021, leveraging its

expertise in digital technology and social networking (Li et al., 2024). This program assisted rural schools in updating and supplementing their educational informatization equipment. Additionally, it enhanced the efficiency of their use of digital educational resources. To address the shortcomings in rural students' information technology courses, the program implemented "double-teacher instruction". This approach involves a remote teacher with a high level of expertise collaborating with a local rural teacher to deliver instruction. Currently, this program has been implemented in 25 provinces (autonomous regions and municipalities) across China and provided more than 2,000 rural primary schools with digital education support.

The government has also placed significant emphasis on fostering parental digital literacy to enhance students' proficiency in digital media. China National Committee for the Wellbeing of the Next Generation of the MOE, in collaboration with Capital Normal University and China Education Network TV, launched "Open Classes on Family Education" to empower the healthy growth of young people. One lesson is titled "Media Literacy and Children's Cell Phone Usage Habits," which helps parents develop good cell phone usage habits while helping their children develop information literacy (China National Committee for the Wellbeing of the Next Generation, MOE, 2020). Wuxi Wu'ai Primary School, for example, has also responded positively to the policy call for family education activities; it launchs a seminar on the theme of "Media Literacy: A Useful Tool for Children's Growth" to help parents better cultivate their children's media literacy (Wuxi Wu'ai Primary School, 2024). Future research should continue to monitor the progress of these initiatives and explore their effectiveness in enhancing students' digital media literacy and narrowing the digital media literacy gap between urban and rural students.

Third, both urban and rural primary school students achieved low scores on creation and dissemination, with no significant difference. This finding is consistent with previous research. For example, Zhou and Tian (2021) found that primary and secondary school students in Tianjin still had much room for improvement in information processing and sharing. Yu et al. (2021) also noted that primary school students scored lowest on the dimension of information thinking and behavior. In Yu et al.'s (2021) study, information behavior referred to the comprehensive awareness and ability to carry out digital communication and learning. Based on a survey of primary and secondary schools in Chengdu, Tan and Lu (2017) found that primary school students had low application indices in social communication and public participation.

The reason for this may be that, for primary school students, the current focuses of digital education are guiding them in the proper use of digital media and improving their abilities to recognize information, control their time, and protect their privacy (China Internet Network Information Center (CNNIC) & Department of Youth Rights and Interests Protection of China Central Committee of the Communist Youth League, 2022). The development of higher-order thinking literacy, such as communication, creativity, and dissemination, has thus not yet been implemented on a daily basis. Moreover, according to the *Annual Report on the Internet Use of Chinese Minors (2021)* (CNNIC & Department of Youth Rights and Interests Protection of China Central Committee of the Communist Youth League, 2022), the proportion of primary school students using all types of internet applications is lower than the average level of underage internet users. Primary school students themselves seem not to have explored the internet sufficiently at this point. This underscores a pervasive challenge within our current education system: fostering student innovation and creativity, which is often stifled by prevailing educational culture. From the perspective of mental structure, Yan (2024) pointed out that, in the East Asian cultural circle, education was burdened with the responsibility of shaping individual destinies and upholding social status. As a result, the content of education was more easily swayed by formalized examination and selection systems. The prevailing educational paradigm, with its emphasis on standardized testing and competition, thus hinders the development of crucial skills such as critical thinking, independent inquiry, and self-expression.

Society in the future will be ever-changing and involve human–computer symbiosis, which requires people to have strong skills in creative discovery and reflective practices, among other abilities (Wu et al., 2021). The poor performance of primary school students in creativity and communication highlights the lack of higher-order thinking skills necessary in the digital age. Critical thinking, creativity, and participation skills thus need to be emphasized for primary school students in the context of participatory culture (Tan & Lu, 2017). Yu and Wang (2020) also pointed out that, due to the rapid changes in information technology and media, information literacy education had to shift from focusing on the acquisition of competency to its maintenance and application. In the future, it would be logical to enrich the forms of digital media literacy education (Huang & Li, 2016), encourage the participation of multiple subjects in digital media literacy education for primary school students (Wu & Huang, 2021), and promote the active participation and creativity of primary school students while protecting them.

5.2 | Influence of Individual and Family Factors on Primary School Students' Digital Media Literacy

In this study, we focus on parental education, parental mediation, and individual time spent using digital media as possible causes of the urban–rural disparity in students' digital media literacy. At the family level, the results show that urban students have higher levels of parental education and mediation than rural students. This finding is in line with previous studies (Liu et al., 2015; Wang et al., 2023). For example, Liu et al. (2015) found that urban parents had more years of education than rural parents and urban parents had higher academic expectations and daily care for their children than rural parents. Wang et al. (2023) also found that urban parents had a more positive attitude toward their children's use of digital devices, provided children with necessary educational functions, and enhanced children's media literacy. Urban–rural disparities may also be due to the urban–rural segregation of Chinese society caused by the household registration system (Huang, 2017), which persists with urbanization and modernization (He, 2022). These economic and political disparities are reflected in the field of education, including the educational levels of urban and rural parents. Parental mediation, in turn, is influenced by the parents' social class, which is to some extent determined by their level of education. There is thus a more pronounced difference between urban and rural students in terms of parental mediation.

Both parental education and parental mediation have a significant positive impact on primary school students' digital media literacy. This finding is consistent with those of previous studies. A study of Brazilian children shows that the higher the level of parental education, the better the digital skills of their children will be (Cabello-Hutt et al., 2018). In Taiwan Province, the higher the level of parental education, the higher the level of digital self-efficacy of students tend to have (Liao et al., 2016). Parental mediation also has an extremely important influence on students' digital media literacy, which supports previous studies. Nikken and Schols (2015) considered parental mediation as a key strategy in developing minors' skills for using and interpreting the media, as well as for promoting positive outcomes while preventing the negative effects of media. Qi and Mo (2016) also noted that active parental mediation facilitated children's ability to critique media content. Rodríguez-de-Dios et al. (2018) found that active parental mediation had a positive effect on adolescents' digital skills.

In conclusion, parents' accompaniment and guidance of primary school students can effectively enhance their digital media literacy. Liu and Wu (2023) found that children with more parental mediation of internet use were more likely to report having higher levels of internet literacy (including self-regulation, reflection, and critical analysis). In brief, the development of digital media literacy among primary school students requires parental mediation in the form of education about appropriate online behavior and active mediation of children's digital media engagement. In October 2023, the *Regulations on the Protection of Minors in Cyberspace* (State Council, 2023) stated that the guardians of minors should strengthen family tutelage and culture, improve their own network literacy, and regulate their behavior in using the network. That can enhance the education, demonstration, guidance, and supervision of minors' behavior in using the network. Since the release of these regulations, regions in China have responded positively by launching distinctive publicity campaigns so that all parties involved in the protection of minors on the internet are fully aware of their obligations. For instance, the staff at a civic activity center in Beijing's Haidian District conducted legal education sessions for residents within their jurisdiction that emphasized parents' responsibility to enhance their own internet literacy (Xinhua News Agency, 2024). Future research could focus on family education of minors' internet literacy and assess improvements to minors' digital media literacy.

Parents with lower levels of education should also proactively enhance their digital media literacy by participating in training programs and self-directed learning, thereby establishing a solid foundation for their engagement in their children's digital activities. While urban parents are able to offer their children more ways to learn through digital devices, the behavior of parental regulation is always centered on children's academics (Wang et al., 2023). Future research can focus on the positive impact of students' digital media literacy on their academic performance so that parents are more aware of the importance of digital media literacy. In addition, parents also need to be careful not to over-supervise and control the digital activities of primary school students. One previous study found that the over-supervision and control of primary school students' use of digital media might increase their risk of becoming addicted to the internet (Li et al., 2021b).

At the individual level, the results showed that both urban and rural students spent more time using digital devices for learning than for entertaining. This finding challenges those of previous studies (Li et al., 2012; Xu, 2023). For example, Li et al. (2012) found that middle school students spent more time on recreational activities than on learning activities, while Xu (2023) also noted that middle school students scored higher for using the internet for entertainment than for learning. The possible reason for this disparity is that the previous studies are conducted with middle school

students, whereas the present study is conducted with primary school students, and there is a difference between these age groups. Another possibility is that the use of digital devices for learning has become important for primary school students, and the learning function of digital devices even exceeds their entertainment function. Rural students also spent significantly more time using digital devices for learning than did urban students. As previously mentioned, this disparity might be attributed to the higher inclination of rural students toward utilizing digital devices for educational purposes, as well as their greater reliance on digital learning resources compared to their urban counterparts. Future research can employ qualitative methods such as interviews and focus groups to gain comprehensive insights into the perceptions, attitudes, and behaviors of children, parents, and teachers regarding the use of digital devices. This could help to reveal the deep-rooted reasons affecting the amount of time students spend using digital devices. It would also be valuable to monitor research investigating the correlation between the increased use of digital devices for studying and improved academic performance among students. This exploration would reveal whether the advances in information technology contribute to narrowing the educational disparity between urban and rural areas.

Time spent on digital devices had a significant positive impact on primary school students' digital media literacy, although scholars had different views on this issue. Appel (2012) found that the amount of time spent using computers outside of school, such as at home, was positively correlated with information literacy, but Yang et al. (2018) found that the longer middle school students used information technology, the lower their information literacy level was. For primary school students, although their exposure to digital media occurs earlier in life, they are still in the early stages of building a digital experience. It may appear that the longer the time students use, the more experience and the higher the level of digital media literacy they will gain. With the promotion and popularization of online learning, primary school students' time spent using digital devices for learning has gradually increased, which has had a positive impact on improving their digital media literacy. However, using digital devices for too long may have negative effects, such as myopia, physical impairment, and decreased academic performance (Bener et al., 2010; Kawashima et al., 2013; Zhang et al., 2023). Although the data suggest that time spent on digital devices has a positive impact on students' digital media literacy, there is a need to regulate the amount of time students spend on digital activities appropriately.

6 Conclusions

This study investigates the levels and differences in digital media literacy of urban and rural primary school students, as well as the influencing factors at the family and individual levels. In general, the overall performance of urban and rural primary school students' digital media literacy level is average, with good performance in the dimension of security and ethics, average performance in the dimensions of access and use, as well as understanding and evaluation, and poor performance in the dimension of creation and dissemination. This indicates that the overall level of digital media literacy among urban and rural primary school students still needs to be improved, especially in the dimension of creation and dissemination. Looking more specifically at the urban–rural disparity, digital media literacy is significantly higher among urban students than among rural students, and urban students have a significantly higher ability to access media information, use media tools, and critically analyze media content than rural students. The third question of this study is to explore in depth the individual and family factors that contribute to the disparity in digital media literacy between urban and rural primary school students. We use SEM to explore how these factors affect students' digital media literacy and find that parental education, parental mediation, and individual time spent using digital devices have a significant effect on students' digital media literacy, with parental mediation having the greatest influence.

Our findings have several implications. First, the survey on the overall level of digital media literacy among primary school students clarifies the current deficiencies and the need for future efforts in digital literacy among primary school students. While focusing on the improvement of primary school students' basic digital media literacy, it will be important to pay attention to the development of their higher-order literacy. Second, the comparative analysis of the digital media literacy levels of primary school students in urban and rural areas shows that rural students need to work hard at the basic level of digital media literacy to better adapt to the digital age. Third, the investigation of the influencing factors on the level of digital media literacy among primary school students provides specific measures to improve their skills. A significant positive correlation between parental education and students' digital media literacy was found in our empirical analysis. Therefore, for parents with a lower level of education, the government and schools should provide appropriate assistance, such as by organizing relevant courses or training, to help them develop a

correct concept of digital media and encourage them to raise their own digital media literacy. Current interventions implemented by the government and educational institutions, such as online lectures and offline seminars focused on enhancing parents' media literacy, require further investigation to determine their effectiveness in achieving the desired outcomes.

This study also found that individual time spent on using digital devices was a significant influencing factor for digital media literacy. For primary school students, the longer they use digital devices, the more experience they accumulate. However, to avoid the negative effects of using digital devices, schools, teachers, and families should properly guide children in their use. For example, teachers could develop a variety of digital education activities in conjunction with the curriculum. At the same time, schools need to emphasize teacher training in digital media to ensure that teachers are equipped to deliver digital education. Parents can encourage children to actively explore digital devices for a reasonable amount of time, but it is important to prevent children from becoming overly addicted.

Parental mediation is found to have the most significant impact on students' digital media literacy, which means that parents should be as aware as possible of their children's ability to process digital media information and support them in facing the barriers they encounter when using digital media devices. Parents should also regulate the amount of time that children spend using digital media devices to ensure that such activities take place in a safe and appropriate environment. Future research should make parents more aware of the importance of digital media literacy for their children's development and encourage parents to actively participate in their children's digital activities to improve their children's digital media literacy.

Although this study has some important findings on the disparity in digital media literacy between urban and rural students, there are also some limitations. First, some important but unobserved factors such as the frequency of digital media use, students' academic performance, and the quality of computer science teachers are not considered. This study also measures participants' digital media literacy based on their self-reports, which may be somewhat subjective. Our research findings do, however, contribute to the research on digital media literacy, as this study validates an instrument that can be used to assess four specific dimensions of digital media literacy among primary school students, as well as identify critical factors that affect the digital media literacy of primary students from urban and rural areas. The findings suggest that to help primary school students better survive in a digital society, their higher-order digital media literacy levels should be further enhanced. More attention should also be paid to the digital divide between urban and rural areas, with particular efforts being made to improve the levels of basic digital media literacy among rural primary school students. While acknowledging the urban–rural divide, this study prioritizes identifying common challenges and potential solutions for improving the digital media literacy of all students.

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